REE FULL-SIZE PLAN INSIDE

MODEL AIRPLANE NEWS

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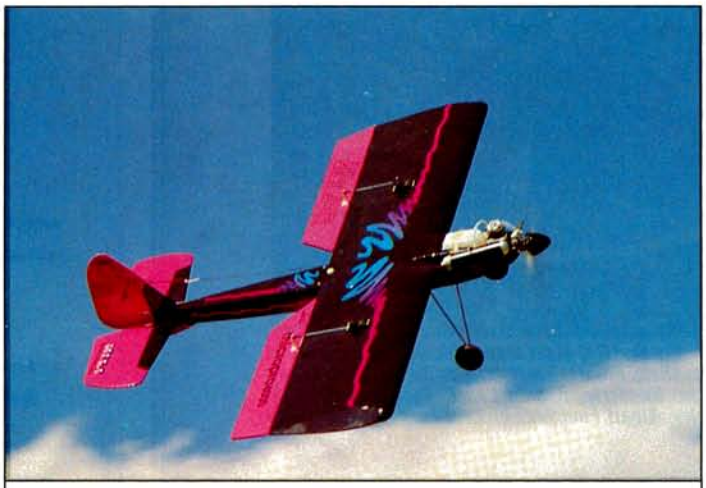
- DESIGN CONTEST FINALISTS
- CONSTRUCTION:
- NEW COLUMN—ENGINES ALOF
- IRVINE Q-40 REVIEWED

JANUARY 1992 VOLUME 120, NUMBER 1

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE



ON THE COVER: *this aeromodeling scene by Jean Oldham was first published on the cover of our March 1930 issue. Over 60 years old, the picture still captures the excitement of preparing a new model for its first flight.*

FEATURES

HELICOPTER SECTION

CONSTRUCTION

FULL-SIZE PULL-OUT PLAN

COLUMNS

COLUMNS

DEPARTMENTS

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EDITORIAL

by TOM ATWOOD

The team responsible for the first R/C flight around Manhattan included a crew of nine and two journalists. From left to right: Alan Abriss, Chris Lanci, Dr. Gerald Schulze, Paul Benderly, Angelo Lanci, Tom Atwood, Tony Cerasani, Richard Turello, Albert Finochio, Vincent Lanci Jr. and Vince Lanci Sr.

A NEW trade organization—the Sport Flyer's Association (SFA)—now offers liability insurance and other services to R/C fliers. Since modelers love to argue, we anticipate much controversy will follow, but all should try to focus on the core issues. Does the SFA offer services to individuals and R/C clubs that are arguably superior or inferior to those previously provided? Will SFA activities accelerate the growth of aeromodeling? If the SFA takes hold, how will this affect the contributions of the AMA?

The answers to these questions will be determined, directly or indirectly, by you, our readers. We live in a society that's based largely on competition—of ideas, products and services. Both the AMA and the SFA are advertisers in this issue. Many have asked why serious insurance alternatives haven't been previously tested in our market. At *Model Airplane News*, we support initiatives that will help to promote the values and benefits of aeromodeling and that will fuel the expansion of our hobby and sport. It's too early to predict the impact of the SFA's entrance, but it will be fascinating finding out. We invite comment on the emergence of the SFA and will publish letters in our "Airwaves" column that reflect the range of opinion received.

A new column, "Engines Aloft", starts with this issue. It's written by Bob Gilbert—a mechanical engineer in the nuclear area and an aggressive R/C sport flier. The column, which is an addition to our other engine columns, will emphasize the testing of engines, both on the ground and airborne.

Fred Baldwin, the designer of the Shuriken engine, has moved to new quarters. He can be reached at: Baldwin Competition Engines, 7265 Mariner Way, Suite 308, Indianapolis, IN 46214; (317) 293-0043. Fred reports he's hard at work on a new line of engines that will include several .40s and a 1ci ducted fan.

This issue's cover, which we first published in March 1930, captures the spirit of aeromodeling in the golden age of aviation. This was a time of unprecedented growth in the hobby. We foresee another such period, made possible by the continued evolution of R/C technology and a growing awareness of the educational and recreational benefits of aeromodeling. In the future, as in the past, *Model Airplane News* will be there to support the hobby's growth and bring you the latest-breaking news.

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AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the writer's identity can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

ERRATA

In the "Carburetor Basics" pullout booklet (November '91), there was a mistake in one of the K&B Sportster carburetor captions. The caption for the idle-mixture screw should have read: clockwise (CW) for a leaner setting and counterclockwise (CCW) for a richer one. We're sorry.

NAVY WINGS

Here's a list of the planes that I flew during WW II:

- Lockheed PV-1 and PV-2 (twin-engine medium bom-bers)
- Consolidated PBY5A (Catalina)
- Consolidated PB4Y-2 Privateer (single-tail B-24)
- Martin JM-1 (B-26)
- Beech SNB-1 (twin-engine trainer; AT-11)
- Douglas R4D-6 (DC-3)
- Douglas R5D (C-54B)
- Martin PBM-3D

I'd like to build a model of each. I've sent letters to many hobby shops, but I can't seem to find any kits for these planes. I want to build them only for show; R/C may come later. Can you help me locate kits? Thank you for whatever you can do.

ROBERT G. TARPLEE
Cincinnati, OH

Rob, you're in luck. Some of the aircraft are available in kits or plans, and you can find sources for them in one publication! Our new book, "Flying Model Warplanes," by John C. Fredriksen, lists thousands of kits and plans from all over the world. This includes the B-24, which you could modify into a PB4Y-2 Privateer, the JM-1 (B-26), the PBY5A Catalina, the R4D-6 (DC-3) and the Lockheed PV-2.

They come in different sizes (too many to list in this space!), and one is bound to meet your needs.

We couldn't find any information on the other planes you mentioned, but maybe a reader will come forth with the name of a supplier. "Flying Model Warplanes" (no. BKP-07911) is offered in the "Buyers' Mart" at the back of this issue. GY

TEACHERS CAN INSPIRE R/C INTEREST

If young people are going to enter this hobby, then it's up to us to help them. Today, kids face more obstacles than many of us did when we were growing up. I don't believe that the ARF explosion or the "tremendous popularity" of R/C cars is keeping kids out of our hobby; neither is the cost nor the initial complexity of R/C equipment.

Kids often have access to more money than our generation did (I'm 44), and many ARFs are well within their reach. Most kids are well acquainted with the complexities of electronic equipment, e.g., computers, stereos and VCRs. (If you want your VCR programmed, ask a kid to do it!) And remember, R/C car radios are just as complex as those used for model aircraft. R/C cars are stepping stones toward R/C aircraft. (I have my students use one to overcome left/right disorientation.) Many of us started in free flight or control-line and graduated to R/C when the technology became more user-friendly, or when we had jobs and could afford it.

It's important to consider both how and why many of us were introduced to this hobby. Most of us had nuclear families; our dads worked during the week (on weekends they "played"—with model airplanes, of course!) and our moms stayed home. Most of us were introduced to model aircraft by our dads. They lived through—perhaps even served in—a war in which aviation played an important role. It was also a war that received much support in this country.

Today, kids spend much less time with their families. Many live in single-parent households or in households where both parents work. They spend a lot of time entertaining themselves—their lives saturated by movies, video games, jobs,

(Continued on page 10)

AIRWAVES

(Continued from page 9)

school and one another. Unfortunately, a growing number are involved in leisure-time activities far less benign.

In my experience, there are two basic reasons why kids don't get involved with R/C flying: lack of awareness and lack of assistance. Unless teachers like me are willing to share this hobby with our students, many will miss the opportunity to become involved. If you're a teacher who's an R/C plane enthusiast, here are some tips on how to get your students involved:

- Have the school library subscribe to *Model Airplane News* or a similar publication. It will be the most read magazine on the rack.
- Videotape your local R/C club members. Play the tape while your kids are entering the room. It will settle them down and, from the questions they ask, you'll discover that few have heard about R/C planes.
- Buy a trainer for your students to use; let anyone who wants to, fly it, regardless of financial status. It won't be very expensive and, with your assistance, it should last forever. Quiet electrics are great for small schoolyards.
- Use model aircraft to teach lessons—not only about lift, weight, thrust, drag and all the mechanical stuff. Think of the chemistry involved in CA. Want to amaze your students with chemistry? Cover a wing section with a heat-sensitive film and teach your class around it.
- Find a spot in your classroom or in a back room in which to help interested students build a small project.
- Always remember: those who can't teach go into a less significant line of work!

Enclosed is a photo of my science club at Georgetown High School. Several of these kids are hooked on R/C for life. Any teachers who want to share ideas about using R/C, please contact me at: Georgetown High School, 2500 North St., P.O. Box 1778, Georgetown, SC 29442; or 1112 Power Ave., Georgetown, SC 29440; (803) 527-2813.

JOHN DAVENPORT
Georgetown, SC

John, thank you for your thoughtful letter on how to bring young people into our hobby and teachers' unique positions to really make a difference. I'm sure that you'll receive a great response, and I hope that you (and others) will keep us posted on your successes. TA

R/C AEROMODELING CLASS

In the September '91 issue, I noticed a letter about an aeromodeling course. This year, I'll be teaching a class on R/C building and flying. About 25 students will attend. Although I have 30 years of building/flying experience, I could still use help. In "Airwaves," it said there's an outline of some successful programs. I'm also looking for an article about an R/C flight-training program. Thanks for a fine magazine.

EDDIE POSTELL
Lake Hills, TX

Eddie, there will be an article on a successful R/C training program in an upcoming issue. (I'll send you some of the material we've received on it to date.) The preceding letter will probably be of interest to you, too. We're very interested in success stories about R/C aeromodeling courses at junior and senior high schools that will inspire others to implement similar programs. We hope to hear from you after your class has become a success. TA

THERMAL SWIMMER

I recently built what I call the "Electric Guppy" from the Rubber Guppy design (published in the January '90 issue). With the electric version, I've achieved 36-minute flights and several 15-minute flights at about 8 p.m., when thermal activity was minimal.

I only made a few modifications to the rubber-powered version. To lengthen the wingspan, I added 8 inches to each inboard wing panel (the wing is now 68 inches). I used spruce spars on top and bottom throughout the wing, hard 1/8-inch balsa webbing for the rest of the inboard wing-panel stations, and medium 1/8-inch balsa webbing for the outer panels. To accommodate the 6-cell battery, I cut a 1 1/2-inch-wide opening into the fuselage from station 5 to station 9. (The hatch cover includes a scoop to cool the battery.) I installed a 1/4-inch plywood bulkhead at the front of the fuselage for the .05 motor. Everything else is the same.

People have said that the Electric Guppy flies better than some commercially available gliders. I thought your readers might want to know. Straight cuts and strong glue joints!

JOHN VALLS
Laredo, TX

John, thanks for the update. Your electric design has much of the rubber-powered design's heritage, and this makes for an interesting change of pace. The flight times you're achieving speak for themselves! If anyone wants to pursue this, the Rubber Guppy is "Model Airplane News" plan no. FSP01901. TA

ABSENT AG-WAGON

I'm trying to find a Kyosho kit of a Cessna 188 Ag-wagon. Apparently, it's no longer available. I had a beautiful model—one that took me a couple of years to finish. I recently flew it for the first time (I even have it on video.) It was great—the best I've ever built or flown. Powered by an O.S. Max .40 Surpass, it sounded wonderful, had a lot of power and was very realistic. (I even put flaps on it, and they provided exceptional slow-speed characteristics.) The model performed aerobatics well—until its fourth flight. The hinge on its left aileron failed, and I couldn't compensate for it in time to prevent the inevitable stop in the sod. Needless to say, the plane is no longer airworthy. The engine, the radio—even "Murdock" the pilot—survived, but I need a new model. I'll be waiting anxiously.

TODD COMBER
Augusta, ME

Todd, you're correct; the Kyosho Cessna 188 kit hasn't been manufactured for quite some time. It's sad when you discover that a particular model isn't available anymore, especially if it's one of your favorites. Perhaps one of our readers has a kit in his attic and would be willing to sell it to you, or maybe someone has plans to offer. If so, we'll pass his name on to you. Good luck. GY

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FIFTY YEARS AGO

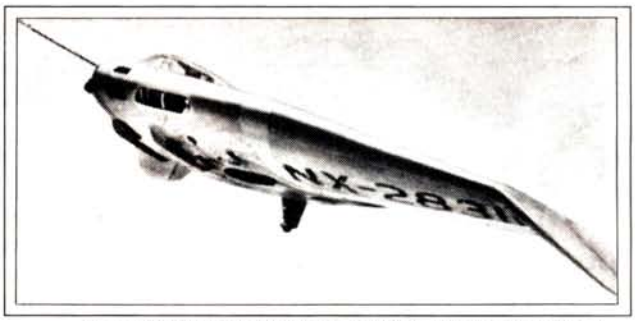
FIGHTER WITHOUT A TAIL

by GERRY YARRISH

THE COVER of the January 1942 issue of *Model Airplane News* must have received a lot of newsstand attention. The Northrop Flying Wing was as futuristic and sleek as anything Buck Rogers or Flash Gordon ever flew. Indeed, we now know that "the fighter without a tail" reflected the future of aviation as shown by today's B-2 bomber and F-117 "Stealth" fighter.

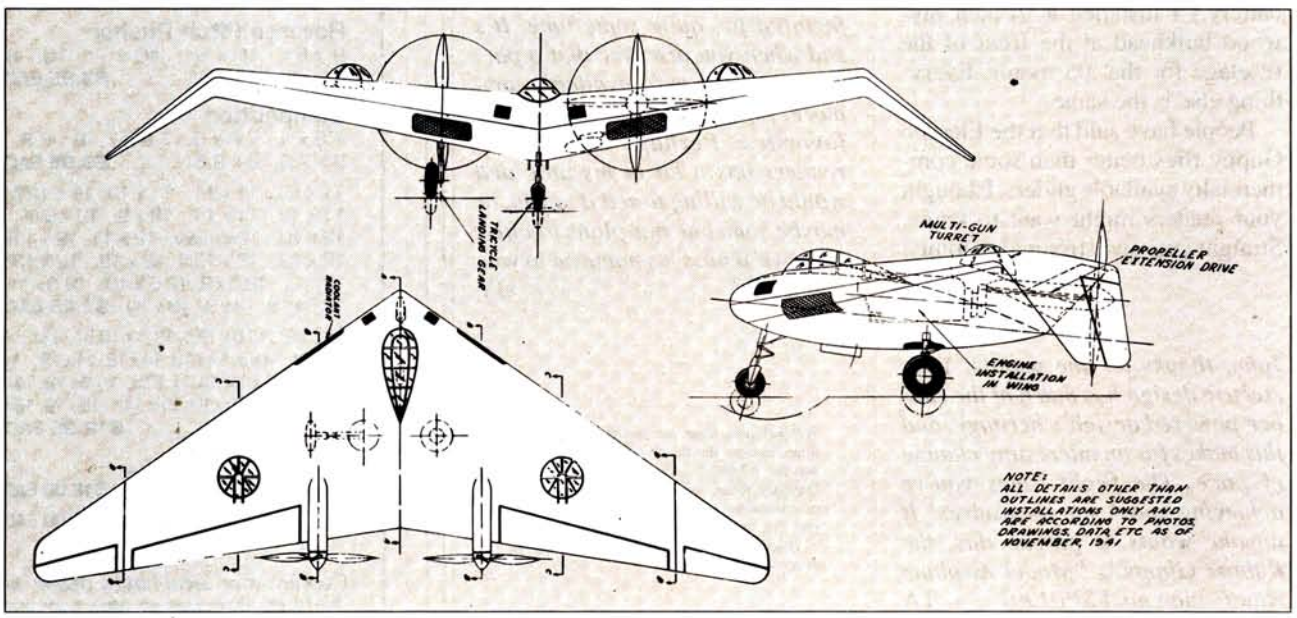
The plane on the cover was the twin-engine test model; it had a wingspan of approximately 45 to 50 feet, and it weighed 3,500 pounds. The wing was completely built of wood—even the spars and the ribs, to which plywood skins were cemented. Its power came from two 300hp, air-cooled Menasco engines that lay on their sides inside the wing (for streamlining). The pilot was housed in a central cockpit that was in the thickest part of the wing. The trike landing gear was retractable, and the outer wing panels drooped to combine the rudder and elevator functions in the same control surface.

Model Airplane News was the first to report on this truly new aircraft design. How come? The wing's designers were awarded a patent that encompassed the entire idea, outline and appearance. A regular patent deals with construction detail and methods—not ornamental design. Design patents were published in the Patent Office's monthly Official Gazette, which was available to the public for general inspection; thus, the design slipped through the usual government security restrictions.



Even after 50 years, the Northrop flying wing looks modern.

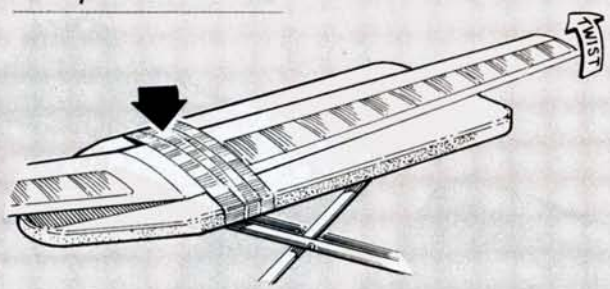
John Northrop stated: "I sincerely believe that this design will add at least 100mph to the speeds of airplanes now in use, and I hope that it will become the first of an entirely new family of airplanes." Considering all their design advantages, I wonder why today's commercial aircraft and airliners aren't gigantic flying wings. What do you think? ■



HINTS & KINKS

Model Airplane News will give a free one-year subsription (or one-yar renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOT YOU SUBMIT.Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

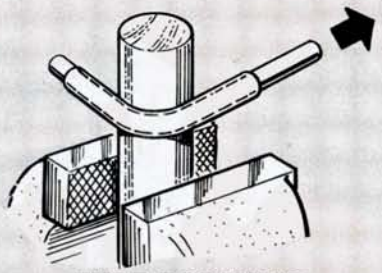
by JIM NEWMAN



IRONING-BOARD THIRD HAND

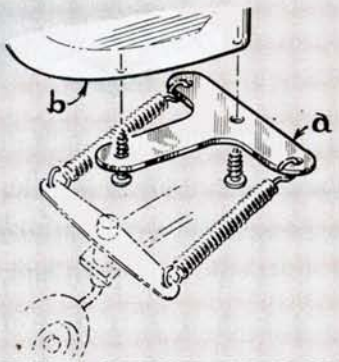
Before trying to twist washout into a wing, strap the wing root securely to an ironing board with an elastic bandage (see arrow). This will leave both of your hands free to operate a heat gun or the iron and to twist the wing.

Jim Newland, Eastsound, WA



TUBE FORMING

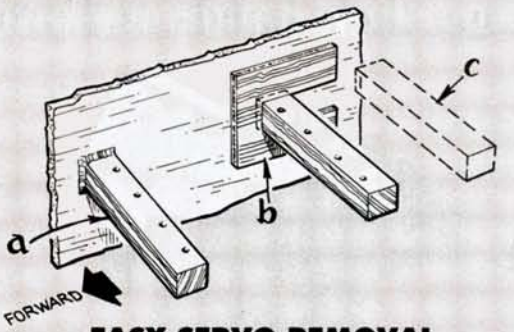
To eliminate the risk of soft brass or copper tube collapsing or kinking when you try to bend it around a dowel or a commercial bender, insert a piece of lubricated copper wire into it. When you've bent the tube, remove the wire by twisting and pulling it with a pair of pliers. To obtain solid copper wire in a variety of sizes, strip the insulation off electrical wires of different thicknesses *Alex Schneider, Clearlake, CA*



TAIL-WHEEL SPRING ATTACHMENT

This simple, effective bracket (a) can be cut out of sheet aluminum, nylon or Formica. You could even modify a U-control bellcrank. Screw it to a hardwood block (b) at the bottom of the rudder, and it will securely hold the springs to those large, steerable tail wheels. The cross piece of (a) should be the same length as the arm on the tail wheel.

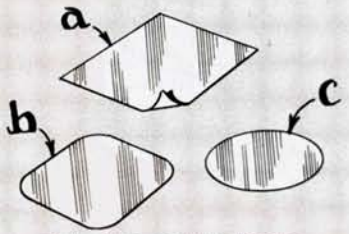
Walt Beike, Portage, IN



EASY SERVO REMOVAL

It's often difficult to remove a servo when it has been tightly installed on its mounts, with no room left for the passage of the servo leads. To avoid this inconvenience, make the rear servo mount removable. Glue the front mount (a) into place, but hold the rear mount only with the slotted plywood piece (b); after you've inserted the servo-mounting screws, it won't be able to move. To remove the servo, take out the rear servo screws and slide the mount out of the plywood.

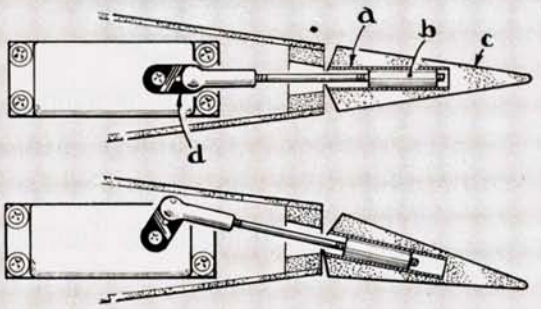
Ralph G. Evans, Tucson, AZ



BETTER PATCHING

When you patch covering with square patches, you risk the corners peeling up after a short while (a). To minimize the chance of this happening, why not round off the corners as in (b)?; circular patches (c) are even better. Patch lifting is more common with iron-on coverings than with doped-on patches.

Robert A. Wintrow Sr., Ridge Spring, SC



HIDDEN CONTROL ACTUATOR

Miniature servos can be comfortably buried inside a wing. Glue a piece of Nyrod outer sleeve (a) inside the aileron so that the piston (b), which is made of inner Nyrod, can slide inside the control surface (c). Rotation of the servo arm (d) tilts the control surface upward and downward. To increase control throw, shift the clevis or ball joint farther out on the servo arm. *F. W. Walker, Shaw, Lancashire, England*

AIR SCOOP

by CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find news that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

TEXAN FROM IOWA

This is project engineer Ken "Johnny Carson" Bundt with the Byron Originals prototype North American T-6. Although its final details have yet to be buttoned up, many flights have been logged on this 1/5-scale addition to the Byron Air Force. With the abundance of area in the 101-inch wing, reports are that the Texan exhibits fantastic slow-flight characteristics and is capable of super scale-like aerobatics. The model will have a two-piece fiberglass fuselage, a fiberglass cowl and a plug-in foam wing, and all the necessary sheeting will be supplied. Production will begin in mid to late spring.

HELI HORSE

Here's the latest Japanese craze: an R/C steeplechase. This event features .60 helicopters fixed to horse figures. The hover-horses race through an obstacle course that includes "touch and jumps" over hurdles. The event is rapidly gaining acceptance; I think that the Japanese have too much time on their hands. The name of the event is Equestrian Air. Wait! What's that? Number 5 is a cow! Uh-oh! Does that mean the name has to be changed to...Dairy Air?

THE LEGENDARY T-BIRD

The aesthetically pleasing, classic curves of the Lockheed T-33 have been given the Bob Violett treatment. BVM demonstrated this 80-inch-span T-33 at many functions during the summer of '91, and the comment heard most often was, "You can really see that jet in the air. It looks so stable and easy to fly." The large T-33 weighs about 14.5 pounds, and it should execute outstanding vertical performance. According to those who have witnessed the prototype in flight, the model is capable of 140mph, but it lands at 30mph. A few of the many reasons the Violett T-33 is a great entry-level ducted-fan project are: factory-sheeted, plug-in wing panels; stabs and fin, which are supplied with internal carbon-fiber structure; and skin detail molded into the epoxy/Kevlar fuselage. It costs $795 with the wing-tip tanks. For more info, call Bob Violett Models at (407) 365-5869.

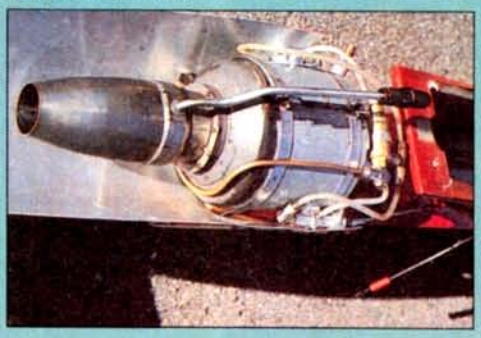
ELECTRIC P-68

The Graupner Partenavia unveiled in Nuremberg last winter is finally arriving at Hobby Lobby International. This high-quality balsa kit has precision-cut parts and many molded, ABS, compound-curved parts that greatly simplify construction. The light structure (3 pounds, 5 ounces) has a 53-inch span, and the very efficient Speed 400 motors require the use of only one 7-cell SCE pack. With its lightweight, high-aspect-ratio wing (and the many advantages of an electric twin), the P-68 could be a surprisingly aerobatic, durable plane. For more info, contact Hobby Lobby at (615) 373-1444.

STRAHLTURBINE SAGA CONTINUES

Long ago, when they recognized the hazards and inefficiency of the pulse-jet design, French designer Michel Serrier and test pilot Alain Oeslick began perfecting a liquid-propane-powered model jet turbine with a full throttle range, even though they were told it couldn't be done.

You'll notice the aerodynamic intake funnel where, before, there had been simple tubing. The small wheel is the fuel-injector needle adjustment, and the stem coming off at a right angle introduces compressed air to "spool" the engine up to the required speed of rotation for primary ignition. This super-clean jet turbine has been mounted in a Sagittarius fantrainer and has logged many successful flights. We hear that the machine sounds "soft, but very realistic" in the air—unlike pulse-jets, which sound like flying jackhammers. Congratulations to Michel and Alain. I'll be seeking further info, so stand by!



Bavarian Blister-Bird

This is a 175mph 1/5-scale German version of a little-known, experimental, late WW II twin pulse-jet pursuit plane that was designed by the English to chase V-2 rockets. The project, code named "Hawker Heater," was abruptly cancelled when, on its first flight, the plane crashed into a pond and boiled more than half the water away. Not surprisingly, the model shares some of the full-size plane's shortcomings; it burns 2 liters of fuel every 5 minutes! Scientific historians generally agree that the violated pond was at the end of the runway where, calculations have proven, the Hawker Heater ran out of fuel. It was either that or the Lucas ignition system. The English *do* try so hard—it's a shame so many of their efforts are thwarted by lousy mileage and faulty points.

CAN YOU IDENTIFY THIS CRAFT?

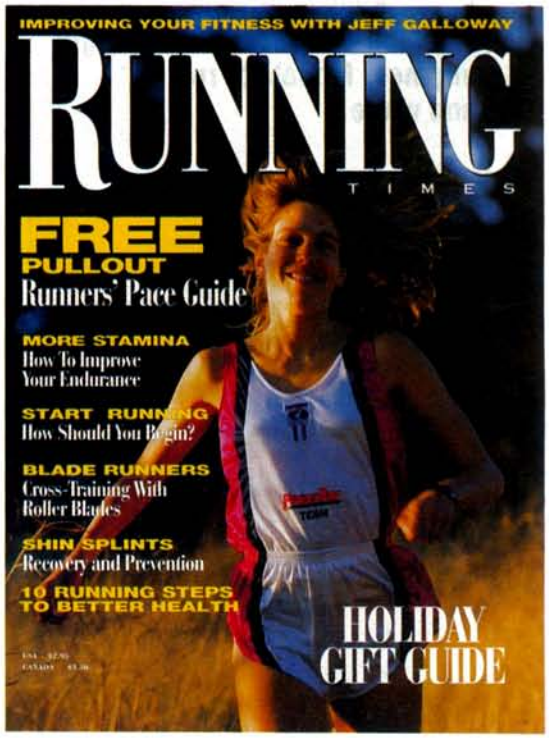
PUBLISHER'S PAGE

by LOUIS V. DeFRANCESCO JR.

AIR AGE ON THE RUN

ON September 6, 1991, Air Age formally announced to the publishing world its acquisition of *Running Times* magazine—the second-largest running magazine in the country. The magazine was previously owned by LFP, Inc., of Beverly Hills, CA.

Running Times, a monthly, is for people who are devoted to running, fitness and the running lifestyle. With its acquisition of *Running Times*, Air Age enters the fitness market.



Our company's success in publishing leisure-time and hobby magazines has compelled us to explore other markets and has challenged us to diversify. After thoroughly researching the running market and seeing its explosive media potential, we know that our "new" publication is destined to be a winner.

But what does all this mean for our R/C publications group?—even more progress, of course! In 1992, we plan to step up our marketing dramatically and to deliver higher-quality magazines (with even *more* reader bonuses) and more books and special issues. *Our overall plan is to maximize the R/C market and gain even more "critical mass" while diversifying into other viable markets.*

My grandfather, the late George C. Johnson, was a great publisher of famous detective and romance magazines of the '20s and '30s as well as the founder of *Model Airplane News*, which is now celebrating its 62nd birthday. Unfortunately, he died in 1944 and, without his direction, many of his magazines faded. His entrepreneurial spirit, however, still lives on with the new Air Age Publishing; we've taken over where he left off and plan to reach new heights—heights he never imagined. ■

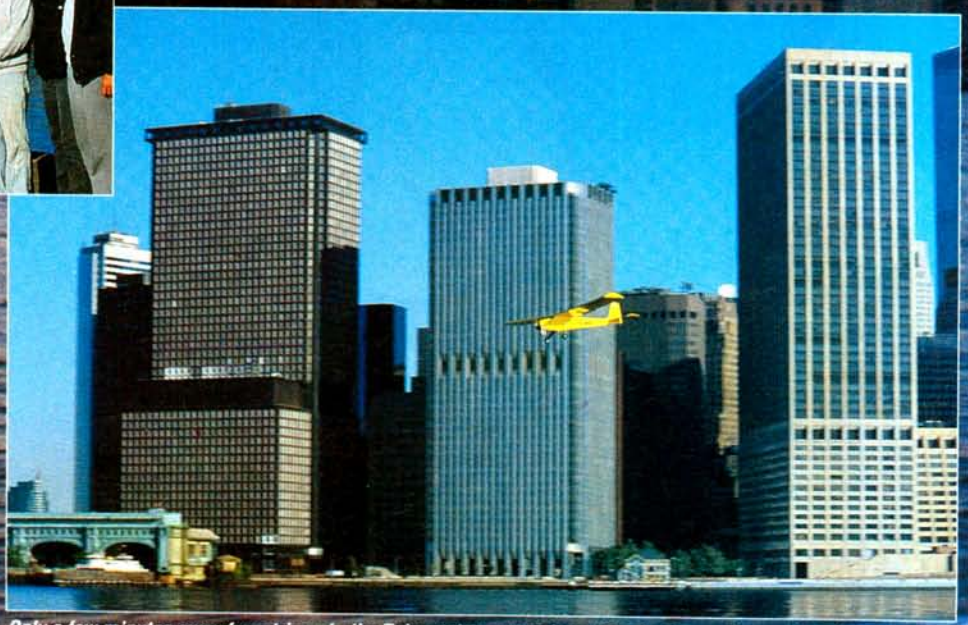
R/C Flight Takes Manhattan

Imagination, two years of planning and teamwork pay off

by TOM ATWOOD

Left: an almost surreal scene: the Telemaster passes by the top of the Chrysler Corporation building. Below: the Telemaster just after it flew under the Brooklyn Bridge.

The team who flew the first R/C flight around Manhattan included a crew of nine and two journalists. From left to right (starting with the crew of the 23-foot Aquasport): Alan Abriss, video-journalist; Chris Lanci, navigator and back-up communications; Dr. Gerald Schulze, skipper; Paul Benderly, back-up pilot and communications officer; Angelo Lanci, team leader, project initiator and chief pilot. On the 27-foot Sea Ray: Tom Atwood, Editor-in-Chief, Model Airplane News; Tony Cerasani, chief R/C pilot; Richard Turello, back-up pilot; Albert Finochio, skipper; Vincent Lanci Jr., first mate and navigator and Vince Lanci Sr., communications officer.



Only a few minutes away from triumph, the Telemaster passes lower Manhattan on its way to a picture-perfect touchdown on Pier 6 in Brooklyn.

ON SEPTEMBER 2, Labor Day, 1991, Angelo Lanci and his eight-member crew set out in the pre-dawn darkness from the northern recesses of Jamaica Bay in Queens, NY, for a history-making R/C flight: the first nonstop, R/C circumnavigation of Manhattan Island.

Two boats were used: a 23-foot Aquasport and a 27-foot Sea Ray. On the initial leg, I was aboard the smaller boat. We were to rendezvous with the other boat out on the Bay and then drive to Pier 6 in Brooklyn, where the flight would begin. As we got underway, Angelo Lanci (R/C pilot and team leader), Dr. Gerald Schulze (skipper), Christopher Lanci (first mate—navigation and back-up communications), and Paul Benderly (communications officer) excitedly discussed the mission, which had been two years in the planning.

On the black horizon, a small light appeared that wasn't frozen with the others on shore; it was the larger boat with the balance of the flight team—Tony Cerasani, chief R/C pilot; Richard Turello, back-up pilot; Albert Finochio, skipper; Vincent Lanci Jr., first mate and navigator, and Vince Lanci Sr., communications officer.

The dark sky, slightly chill morning air and occasional sheets of salt spray jetting over the bow added to our excitement as we headed out to the Atlantic. Approximately an hour later, we arrived at Pier 6 in Brooklyn, a largely inactive facility and a perfect launching and landing site.

SENIOR TELEMASTER

The plane—a Senior Telemaster donated by Hobby Lobby*—had been modified slightly to carry a Zenoah G-23 and just over 2 liters of fuel. It was selected because of its predictable flight characteristics. Its flight speed was approximately 30 knots with custom flaps down (they were extended during the entire flight). The boat's top speed was just under 30 knots. Futaba* donated top-of-the-line equipment: the team used two Super Seven PCM 1024 radios (on channel 55) that proved faultless in what could be described as a "hostile" environment.

The flight was to proceed around the southern tip of Manhattan, up the Hudson River, down the Harlem River and the East River, passing the United Nations and finally lower Manhattan. Total elapsed flying time was projected to be about 90 minutes. (Continued on page 78)

The X-Ray stands by as the bridge blocking access to the Harlem River is opened for our passage. Angelo Lanci, pilot, circles the "Telemaster."

Above: the Telemaster is prepared for flight. Left: as the Little Princess, a 27-foot Sea Ray, heads up the Hudson River, Captain Albert Finochio(left), Tony Cerasani, cheif R/C pilot (middle), and Communications Officer Vincent Lanci Sr. (right) concentrate on the course ahead.

PHOTOS BY TOM ATWOOD

THE 2ND GREAT R/C DESIGN CONTEST

Help choose the winners!

It was with great excitement that we pored over the nearly 200 fine entries that we received in this, our "Second Great R/C Design Contest"! We'll award the lucky winners $1,200 (1st place), $900 (2nd), $750 (3rd), $500 (4th) and $250 (5th). We'll publish construction articles to show the winning aircraft as well as other notable entries.

We thank all the modelers who worked so hard on their models and made this contest a success. This includes those whose fine airplanes didn't make it into this issue because of space limitations.

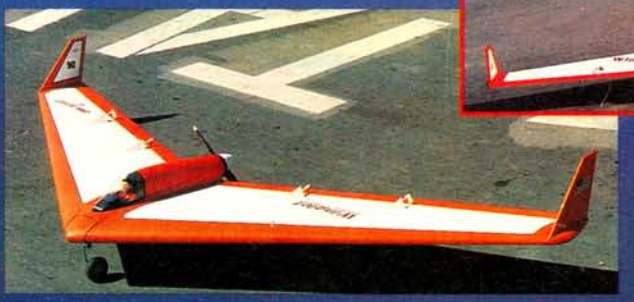
So, pull out your pen, take a close look at the finalists' designs, and pick the model aircraft you regard as the most original and impressive, and which you'd like to see featured in Model Airplane News. Please fill out the included ballot form and mail it to: "Design Contest Winners," Model Airplane News, 251 Danbury Rd., Wilton, CT 06897, by January 15, 1992. Taking into consideration your ballots, the models' originality, modeling craftsmanship and overall appeal, the editors of Model Airplane News will pick the winners.

1 ▲
Micro Jet II. Power: Cox TD .049/.051. Designed as the "smallest possible model," using standard radio gear; 2 oz. of fuel provides 12-minutes flights. Built from scrap balsa and hardware, and swatches of old plastic film covering, it provides jet looks and performance on "the tightest of budgets." Uses mini-battery. WS: 18"; WT: 16.5 oz.
—Michael Van Staagen, Greenville, NC.

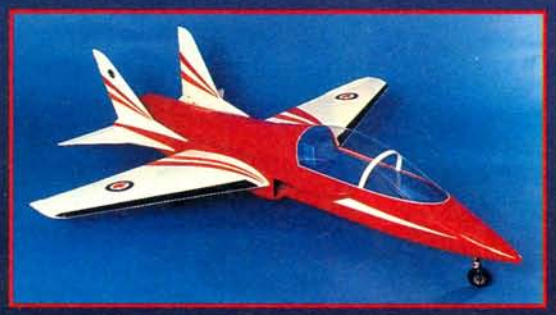
2 ▲
Krazy Kaos sport plane. Power: .46 Super Tigre with tuned pipe. Fuse is made of lite-ply formers covered with pre-cured 3/32-inch balsa. Wings are swept forward 20 degrees. WS: 60"; WT: 6 lbs., 4 oz.
—John L. Ogershok, Reynoldsburg, OH.

3 ▲
Super Cake sport plane. Power: HB .15. Stan said he wanted to build a plane that would be "slippery enough to handle wind, takeoff anyplace, climb like a rocket, land like a parachute, thermal, slope soar, howl around like a U-control, look great, be stable enough to be flown by spectators, cheap, and easy for a first-timer to build." Stick construction; lifting stab. WS: 72"; WT: 44 oz.; WL: 11 oz./sq. ft.
—Stan Rutz, Muskegon, MI.

THE 2ND GREAT R/C DESIGN CONTEST



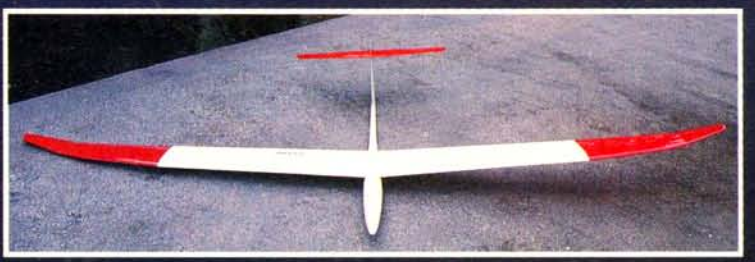
4
Winglet sport airplane. Power: pusher K&B .40. Built-up balsa, plywood and spruce construction. Includes split drag-control surfaces, flight lights and steerable nose gear. Removable nose piece, canopy and wing panels for servo access. Will do flat inverted flight, on-axis rolls, inside/outside loops, horizontal/vertical 8s, and more. WS: 74"; L: 31".
—Richard M. Engel, Cypress, CA.



5
Scale BD-10. Power: K&B 7.5cc ducted-fan, O.S. .46 or Rossi .50. Accepts most 5" fan units; retract gear optional. Control functions: rudder, elevator, throttle, aileron. WS: 52"; L: 58"; WT: 8.5 lbs.
—Louis Lengyel, Chambly, Quebec, Canada.

★ ★ ★ ★

6
Aeolus unlimited-class T-tail sailplane. Kevlar/glass fuselage and obechi/foam three-piece bolt-on wing. Great performance in calm and in windy weather. A proven winner on ESL contest circuit. SD-8000 airfoil with 8% thickness means it flies fast! WS: 128"; WT: 72 oz.; WL: 9.5 oz./sq. ft.
—Michael Lachowski, Milford, NJ.



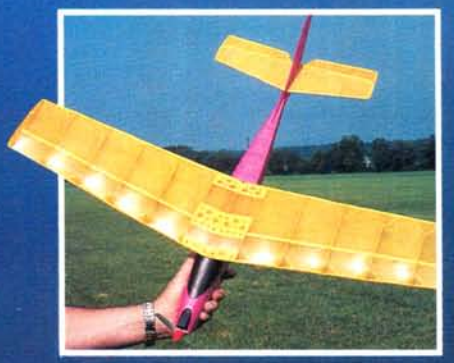
7
Quarter-scale rendition of Bob Speed's Beer-Cat. Power: K&B .61 with pump. Negative stagger biplane that's fast, clean and not too large to transport. Balsa box fuselage and sheeted foam-core wings. Fabric used where cloth was used on the original; other surfaces glassed. WS: 48"; WT: 9.5 lbs.
—Al Culver, Wilder, ID.

8
Quarter-scale Skyote. Power: .90 to 1.20 4-stroke; .60 to .90 2-stroke. Full-scale homebuilt made April 1987 Model Airplane News cover. Budd Davison said it's an "American homebuilt with Jungmeister appeal." WS: 60"; WT: 8.5 lbs. Builders took Budd's advice that a "1/4-scale Skyote would be a stand-out winner."
—Tom Hayden, E. Liverpool, OH, and Rick Steed, Wellsville, OH.

9
Small, aerobatic, 4-stroke sport plane. Power: O.S. .26 FS. This unusual "pattern"-looking aerobat was designed around a small 4-stroke. WS: 54"; WT: 54 oz.
—Peter Skov, Frederiksberg, Denmark.

10
A-10 sport-scale ducted fan. Power: two Tee Dee .51s. Engine housings are made of 2-liter soda bottles; single fuel tank. Built of balsa; covered in MonoKote. Inexpensive Warthog "flies great" on two channels: aileron and elevator. WS: 56"; WT: 2 lbs., 2 oz.
—John Kidd, Mandeville, LA.

11
Dragonfly II sport plane. Power: .40 to .50. Builder is 16 and has been flying R/C since he was 12. Symmetrical wings with slight dihedral used on this built-up, 3- or 4-channel design. Ailerons on front wing are electronically coupled with rudder; glides well; wide speed range. WS: 52"; WT: 8 lbs., 16 oz.
—Zachary Krachinski, LaPorte, IN.



13
Pinky miniature electric sport plane. Power: miniature ferrite motor, six Sanyo 270mAh Ni-Cds. Flies 9.5 minutes at full throttle. "Set and quarter twist" wing installation (no rubber bands or screws). Futaba 4NBL/E radio used as manufactured. Three channels: rudder, elevator and throttle. WS: 34"; WT" 9.75 oz.; WL: 6.35 oz./sq. ft.
—John K. Jonas, Jr., Asheville, NC.

★ ★ ★ ★ ★

12
Willit: a third-generation aerobatic canard sport plane that's designed for performance. Of built-up balsa with foam wings and balsa sheeting, balsa/graphite laminate canards, and a balsa slab fuse with fiberglass canopy and turtle deck. Said to be capable of the flattest spins. WS: 72"; WT: 7lbs., 2 oz.
—Bill Matthews, New Orleans, LA.

14
Electric Dornier DO17 VI prototype. Power: two Astro 020 Cobalts turning Cox 5.5x4 props; eight 800mAh AR Sanyos. With 65 watts per pound, this aerobatic plane can do spins and snap rolls. The hand-launch model includes aileron, rudder, elevator and speed controller. WS: 42"; WT: 37 oz.; WL: 19 oz./sq. ft.
—Martin Irvine, Kingston, Ontario, Canada.

15
Twice-as-Hot electric twin. Power: .05 to .15 Cobalt or .10 to .20 glow engine. The 4-channel version includes on/off (and flap), twin rudders, elevator, ailerons. Five-channel version has throttle and variable flap during flight (flap is in center section of wing). Two standard servos and two microservos. Said to be easier to handle than a single-engine version. WS: 57"; WT 44 oz.; WL: 19.6 oz./sq. ft.
—Steve A. Schofro, Costa Mesa, CA.

16
Calypso hand-launch glider. Placed 10th in '91 Nats. Graceful ship designed using CAD software. Wing curvature is highly aerodynamic. WS: 1.5m; WT: 13.5 oz.; WL: 5.3 oz./sq. ft.
—Robert Massmann, Wilmington, OH.

17
Sport-scale Lockheed Air Express. Power: K&B .65 Sportster (or .90 4-stroke). This re-creation of the 1928 airplane is covered in Coverite Permagloss. All wood with sheeted wing and planked fuse. WS: 60"; WT: 7.5 lbs.
—Pete Fusco, Kingwood, TX.

18
CR-270 sport bipe. Power: Super Tigre 2500. This agile sport biplane, built of balsa and ply, offers authoritative vertical performance. WS: 66.5"; WT: 12 lbs.
—Chuck Rhodes, Warsaw, OH.

19
Grandson .40 electric bipe. Power: geared Astro Cobalt 40 and 21 900mAh Ni-Cds. Based on three previous electric bipes. A Jomar SC-4 speed controller adjusts 14x8 prop's rpm for a smooth, easy-flying plane. WS: 61"; WT: 7lbs., 5 oz.; WL: 14.16 oz./sq. ft.
—Ellis Grumer, Phillipsburg, NJ .

THE 2ND GREAT R/C DESIGN CONTEST

20
Stealth-E electric ducted fan. Power: 14-turn quad-wound BB .05 motor with wet magnets; seven 1500mAh Ni-Cds. All-balsa with fiberglass reinforcements in duct and belly. Small, fast, maneuverable (yes, we have flight shots!). Innovative fan uses two, three-blade, 5x3.5 pushers cut down to $3^{13}/_{16}$ inches and mounted at 0 degrees for slotted effect. WS: 36"; WT: 39.9 oz.
—Jeffrey Holan, Glen Ellyn, IL.

22
Shearsing (Hornette) Mk V sport electric. Power: Graupner 600BB .05 motors spin 7x4 props; two 7-cell Ni-Cd packs in series. Moderately fast and easily hand-launched—a "hot" electric that flies with inexpensive motors and batteries. Elevator, ailerons and throttle—no rudder. WS: 48"; WT: 4 lbs.
—Stan Jonutis, Forestdale, MA.

21
Heretic: a flying-wing sport plane. Power: ASP .40. Balsa and bamboo construction; cockpit consists of balsa sheeting over bamboo. A solid flier. WS: 48"; WT: 5.5 lbs.
—John W. Norton, Ocala, FL.

23
El Guaraguao (Bird of Prey) sailplane. Power: .049. Scratch-built, 2-channel ship was builder's first model. WT: 34 oz.
—Samuel Cruz Nieves, Puente Blanco, Utuado, P.R.

24
XB-70 Valkyrie scale ducted fan. Power: two KBV.82s turning Bob Violett Viojett fans. This 108-inch-long model has many advanced features, including, dual disk brakes, functional canards, sequenced gear doors, outer wing panels that droop and an inclined windshield (per original). WS: 60"; WT: 35 lbs.; WL: 23.05 oz./sq. ft.
—Bill Hatcher and Bob Hodge, Naples, FL.

25
Rotary-powered paraplane: new invention based on 10 years of research; an "advanced version of the conventional square paraplane." WS: 21". Power: Enya .09 to .19. Rotating parachute pivots on a gimba; aileron and elevator servos are coupled on a sliding tray. Throttle and rudder are coupled to counterbalance torque. Generator made from Radio Shack motor powers secondary motors that spin a rotary wing at a constant rpm. Auxiliary rotors autorotate. Flies like an airplane, but is more stable.
—Copeland Wallace-Morrison, Plainfield, NJ.

26
One-third-scale Skyote. Power: O.S. FF 240. Inspired by April '87 Model Airplane News. Builder used original drawings and three-views provided by Frank Bartoe for this super scale study. WS: 84"; WT: 26 lbs.
—Bill Nelson, Beaumont, TX.

28 ▲
Seahawk: advanced low-wing aircraft with flaps, and optional floats and sub-fin. Power: .46ci 2-stroke with 11x8 prop. Uses wheels or floats; "thrilling" performance. Seems to be first application of Youngman slotted flaps to a model. WS: 64"; WT: 110 oz. (land), 121 oz. (water); WL: 24.3 oz./sq. ft (land), 26.6 oz./sq. ft (water).
—A.G. Lennon, Dollard des Ormeaux, Quebec, Canada.

27 ▶
Electric scale Spitfire Mk 1. Power: Astro .035 Cobalt, five 900mAh cells. Foam fuselage sections shaped with hot wire, covered with brown paper and diluted white glue. Smooth, hard fuse surface built in two evenings; airframe total weight: 6 ounces. Exceptional flight performance. WS: 36"; WT: 24 oz.; WL:18 oz./sq. ft.
—Scott Black, Montreal, Quebec, Canada.

29 ▶
Electric tractor, tandem-wing glider; Leisure .05 motor and 7-cell 800mAh battery. Simple balsa construction; ailerons on aft wing, elevator/flap on canard; center of gravity can be varied. Soars well, moderate speed and roll rate, stall-proof.
—Rolf H. Anderson, Agoura, CA.

30 ▲
Vampire Bomber: .60 sport aircraft. Power: Rossi .60 side exhaust with STM silent tuned pipe. Forward lower intake forces air over enclosed tuned pipe; right scoop guides air over engine head; left scoop pushes exhaust gases into prop. Ram air with three-blade prop provides a "unique sound." Twin, externally mounted bombs; electronic mixing of canards and elevator; and 7-channel control tops off this built-up design.
—Jim Smith, Tampa, FL.

31 ◀
Twenty-eight-percent exact scale, 1914 Sopwith Tabloid. Power: Super Tigre 3000. Mainly of spruce and ply (also a little balsa and lite-ply); fiberglass cowl; Coverite covering. Five channels include wing-warping, onboard ignition and in-flight mixture control. Placed 3rd in '90 Schneider Cup Re-Enactment. WS: 85½"; WT: 21 lbs.
—Ian D. McInnes, San Jose, CA.

33 ▲
Swept Canard Concept glider—a product of research in a home-built wind tunnel, this 2-channel balsa ship has foam-core wings. WS: 78"; WT: 28 oz. L: 34".
—Greg Yarbenet, Girard, PA.

32 ▶
Tenth-scale Dornier 335 (V3). Power: twin O.S. Max .25 FPs. Designed from drawings and photos received directly from Dornier. Built-up construction: sheet balsa covered with glass cloth/resin. Spring-Air retracts and flaps. Twin engines in push/pull configuration provide torque-cancelling thrust for solid climb-outs. Design lacks problems usually associated with conventional twins. Impressive silhouette. WS: 56"; WT: 9 lbs.
—Al Masters, Rocky River, OH.

THE 2ND GREAT R/C DESIGN CONTEST

34
Modifly: sport/old-timer. Power: .20 2-stroke. Retains OTer appearance and flight, but has been modified to use R/C and be more maneuverable: longer nose moment; small (22%) non-lifting stab; thin, flat-bottom airfoil; polyhedral wing; engine throttle control. Leaps off ground in a few feet. WS: 72"; WL: 10 oz./sq. ft. Photo by Glen Neil.
—David W. Gilbert, Houston, TX.

35
Quarter-scale, 1931 Bernard HV220, Schneider Cup Racer. Power: Super Tigre 6000 twin. Has built-up construction with balsa/glass-cloth-sheeted foam-core wings; built-up tail feathers. WS: 92.5"; WT: 40 lbs.
—Donald R. Panek, Wofford Heights, CA.

36
Arapahoe sailplane. Result of years of experimentation. All-balsa, 4-channel sailplane has flaps capable of 45-degree down deflection and flying stab. WS:126"; WT: 54 oz.
—Albert T. Dalnoki, Willis, TX.

37
Nanosaur: a flying-wing glider inspired by articles on flying wings and the early experiments of Northrop and the Horten brothers. Eppler airfoils limit pitch sensitivity (three are used from root to tip), and a large chord is used to "escape Reynolds-number trouble." Foam-core wings are balsa sheeted. WS: 122.5"; WT: 84 oz.; WL: 7.6 oz./sq. ft.
—Marc B. Vepraskas, Lithonia, GA.

38
Utilizer 60/40 push/pull sport plane. Power: O.S. .61 and K&B .40 (up to .65 in front and .46 in rear). Lite-ply and balsa construction, with balsa-sheeted foam-core wing. Constant-chord, fully symmetrical, polyhedral wing rises then angles downward 8 inches from the tip. Flaps and Rhom-Air retracts; twin boom and rudders. Flies fast; not for beginners. WS: 80"; WT: 11 lbs., 1 oz.
—Doug Stephenson, Pueblo, CO.

39
Sky Blazer bipe. Power: Zenoah G-23. Designed to be small and inexpensive, yet meet IMAA requirements. Six servos (not heavy-duty); lite-ply fuselage with stringers; built-up wings and tail feathers. Two-piece struts are mounted on fuse when wing is in place. Quick and aerobatic, yet stable. WS: 62.5" (top), 58" (bottom).
—Steve Jordan, Council Bluffs, IA.

40
Quarter-semi-scale ("pretty-near scale") Jungmeister I biplane. Power: O.S. .90 4-stroke. Scaled from original documentation, it has adjustable cabanes and interplane struts and removable, adjustable horizontal stab. A few minutes with a screw/nut driver permits a whole new setup. Built-up construction: mostly balsa and some plywood, bass and spruce. Pull-pull rudder. WS: 51"; WT: 7 lbs.
—Harry Stewart, Nevada City, CA.

41 ▼
Osprey auto gyro. Power: O.S. .15. Uses rudder elevator control, but handles very differently from a conventional plane. Excellent for small fields. Rotor span: 23"; WT: 2.5 lbs.
—Andrew G. Fanning, Federal Way, WA.

42 ▲
Keystone-Loening C2C; 1.5" to 1-foot scale. Power: O.S. .48 Surpass. Original, built in 1928 and powered by a Wright Cyclone, served Muskegon and "was the same plane that Lindbergh used to fly the Morrow family home for their wedding." Built-up construction is "simpler than it looks". Retract gear is manually operated but not stressed for wheel landings. Next version will be. WS 70"; WT: 7.5 lbs.
—Stan Rutz, Muskegon, MI.

◀ **43**
Quarter-scale clipped-wing Taylorcraft. Power: O.S. .120 4-stroke, Super Tigre 3000, or Quadra .35. Modeled after a plane made by Swick Aircraft Co. WS: 90"; WT: 12 to 15 lbs. (depending on engine).
—Jim Simpson, Rio Rancho, NM.

44 ▶
Convertible bipe. Power: Fox Eagle .60. An offshoot of a control-line stunt ship the builder developed in 1947. May be flown as a high-wing, a low-wing, or a biplane. Features gapless ailerons and pylon/parasol upper wing mount.
—Russelle Henry Sr., Cedar Grove, ID.

45 ▲
Tube-E electric fun-fly competition ship. Power: geared Astro FAI OS on eight cells, and a speed controller. Able to fly full competition circuit and is competitive with glow ships. Full mixing. WS 40"; WT: 40 oz.; WL: 11 oz./sq. ft.
—Martin Irvine, Kingston, Ontario, Canada.

OFFICIAL MODEL AIRPLANE NEWS DESIGN CONTEST BALLOT

FILL IN THE NAME AND CORRESPONDING ID NUMBER OF YOUR TOP FIVE CHOICES.

	PLANE	NUMBER
1ST		
2ND		
3RD		
4TH		
5TH		

PLEASE INDICATE THREE ADDITIONAL DESIGN CONTEST PLANES YOU'D LIKE TO SEE AS CONSTRUCTION ARTICLES IN *MODEL AIRPLANE NEWS*.

1.		
2.		
3.		

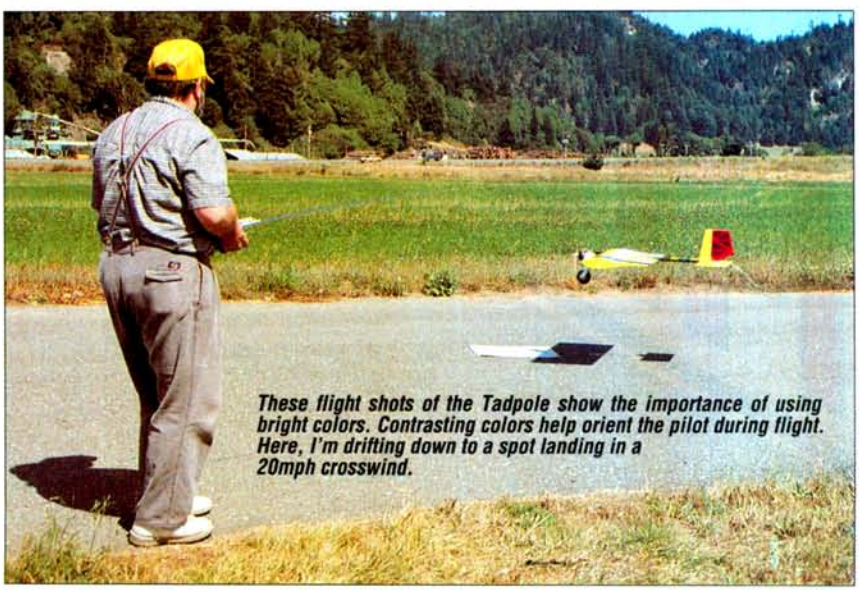
Mail your ballot to: Design Contest Winners, *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897.

Double-reflex fun-fly winner

THE TADPOLE

WOULD YOU like to win a radio set or a brand-new engine? Would you like to decorate your shop with ribbons and trophies? How about good old cash; could you use a little extra? There are more chances to win these prizes at fun flys than at any other type of powered-model contest; and with the Tadpole and practice, you can clean up. Almost every club has at least one fun fly a year, and some have several. By flying a Tadpole in the competition at your own club and traveling to a few neighboring clubs, you can have a lot of fun, make some new modeling friends and win a surprising amount of loot in the bargain.

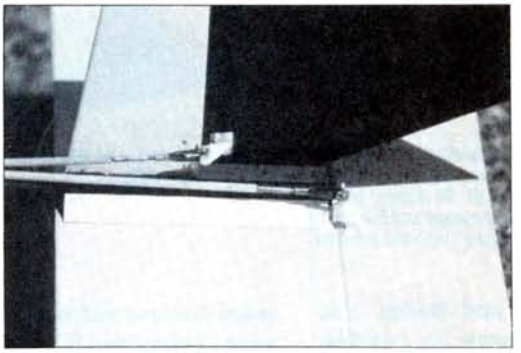
by JOE GEIGER



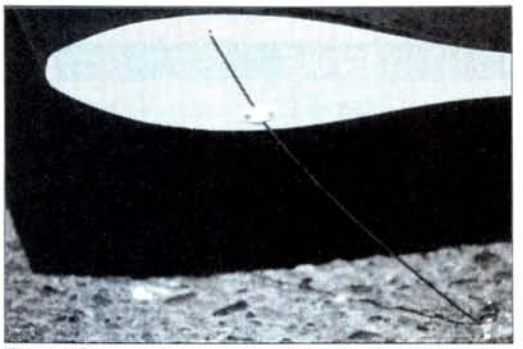
These flight shots of the Tadpole show the importance of using bright colors. Contrasting colors help orient the pilot during flight. Here, I'm drifting down to a spot landing in a 20mph crosswind.

PHOTOS BY HAROLD AUERHAN

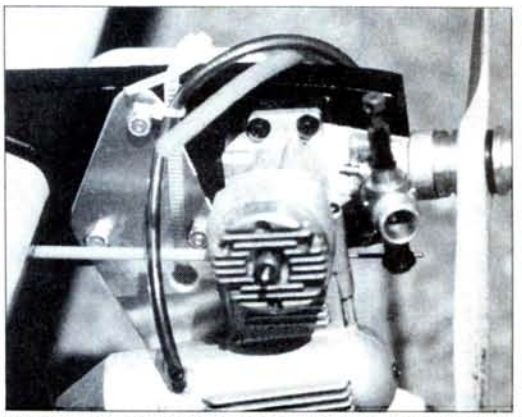
THE TADPOLE



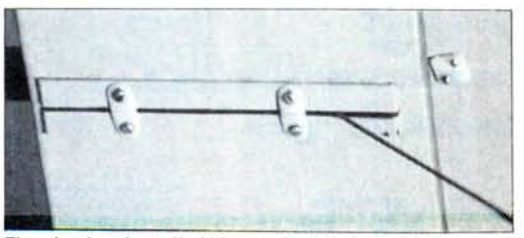
Use 1/2A control horns on the rudder and the elevator. You can harden the balsa where these horns are mounted by creating pinholes and filling them with thin CA.



The tip skids are attached with a Z-bend and a landing-gear strap. Be sure to reinforce the wing tips with small pieces of 1/16-inch ply on the inside.



The side-mounted engine and 2-ounce tank make everything very accessible. The aluminum landing-gear legs are mounted right behind the engine.

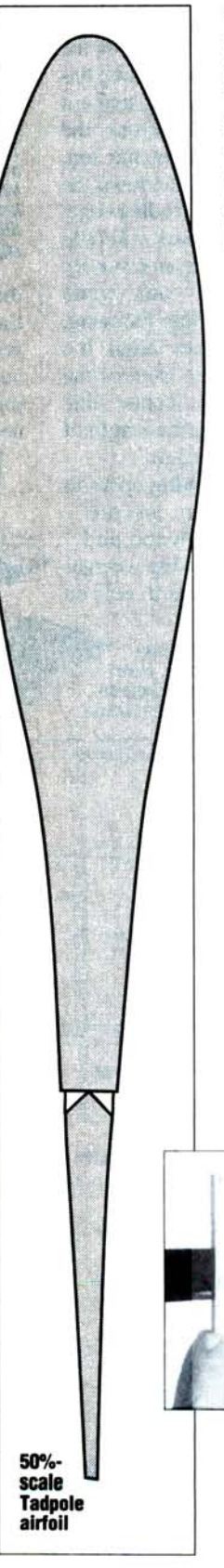


The simple wire tail skid gets the job done with minimal weight.

At its most recent competition, the Tadpole not only won 1st place overall, but it also had best times in every single event, and this was at a contest in which competition planes and pilots were separated into their own class. Now, you may be thinking, "Sure, but this guy is probably some hot-shot youngster with eagle eyes and lightning-fast reflexes." Well, the gray in my hair (what little is left of it) and the Coke-bottle-thick glasses I wear should convince you otherwise. My advantages are the Tadpole and practice; that's it.

Maybe you aren't really interested in prizes and competition, but you'd like to fly a plane that's inexpensive, easy to build, and incredibly nimble and quick. The plane presented here is the culmination of three years of development, and it could be the most outrageous performer you've ever flown.

The Tadpole's most noticeable characteristic is its airfoil, and herein lies its biggest asset. The double reflex of this shape gives it a tremendous advantage in slow flight, whether upright or inverted, and allows instantaneous acceleration; it floats along like a butterfly, or leaps forward like a scalded cat. Takeoffs require about 3 feet of runway, and spot landings can be done on a car mat. When you're familiar with your Tadpole, you'll be able to take off, do five loops and five rolls, interspersed, and land in less than half a minute, with the plane never more than 80 feet away from you. No, I'm not exaggerating. This kind of performance is normal for the Tadpole when it's set up with full throws and a programmable radio. If this appeals to you, let's get busy and build one. It isn't hard and it won't take long.

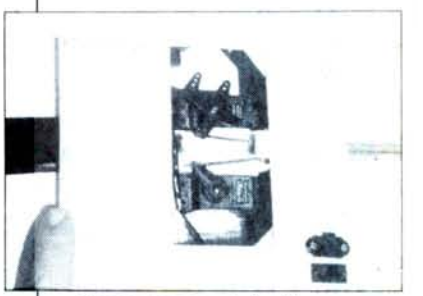


50%-scale Tadpole airfoil

CONSTRUCTION

• **Preparation.** To perform properly, the Tadpole must be built as light as possible and perfectly straight. Spend a little extra time checking for straightness as you proceed from step to step, so that you don't accidentally build in any twists or warps as you go along.

Almost all parts are made of sheet and sticks, so there's almost no advantage in buying a kit of this model; simply make a set of ribs, and the hard part is done. I prefer to stack the necessary number of sheets for a set of ribs, then put a rib template on top and band saw the whole stack at once. Put another template on the opposite end of the stack and sand them, then cut the spar slots. A short piece of broom handle

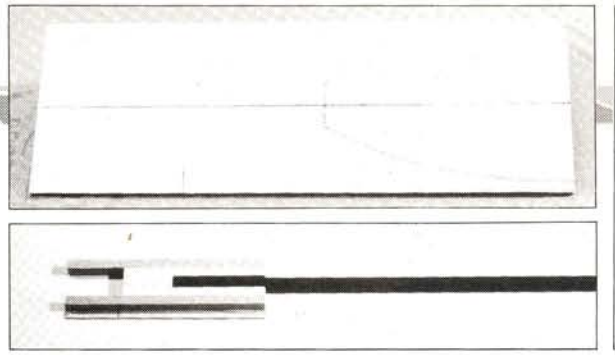


Servos are mounted with servo tape. Run 1/16-inch pushrods from the servos to the tail surfaces inside the inner tubes of Gold-N-Rods. Small pieces of the outer tubing are taped to the tail boom as guides.

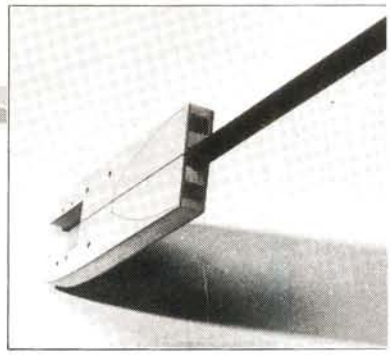
THE TADPOLE

with some sandpaper wrapped around it makes a handy tool for sanding the reflex sections of the airfoil. When sanding has been completed, make a broad mark across the whole stack on the top, and draw a line down the center of the leading edge. The broad mark will help you keep the same side up on all the ribs while you're building the wing, and you can align the marks on the front of the ribs with a center line drawn along the length of the leading edge.

Join the wing spars to their doublers, and prepare the plywood pod sides by drawing a center line from front to rear on the inside and the outside. Laminate W1 to W2, and you're ready to begin assembly. CA is used throughout; no epoxy is necessary or desirable.

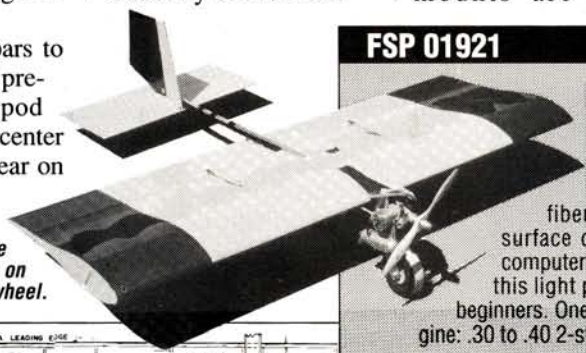


Top: the center lines drawn on the inside and outside of the plywood pod sides help maintain alignment during construction. It's also helpful to trace the position of the forward rib half. ■ Above: shown here are the tail boom, the maple motor-mount bearers and the balsa filler installed. The assembly is then "sandwiched" with the remaining pod side.



The finished pod and boom are ready for spar slots.

• **Pod and Boom.** Use your engine to establish the correct space between the maple motor mounts, and make sure that the mounts are spaced equally above and below your center line. If your engine/muffler combination weighs more than 10 ounces, you'll want to shorten the nose a bit (up

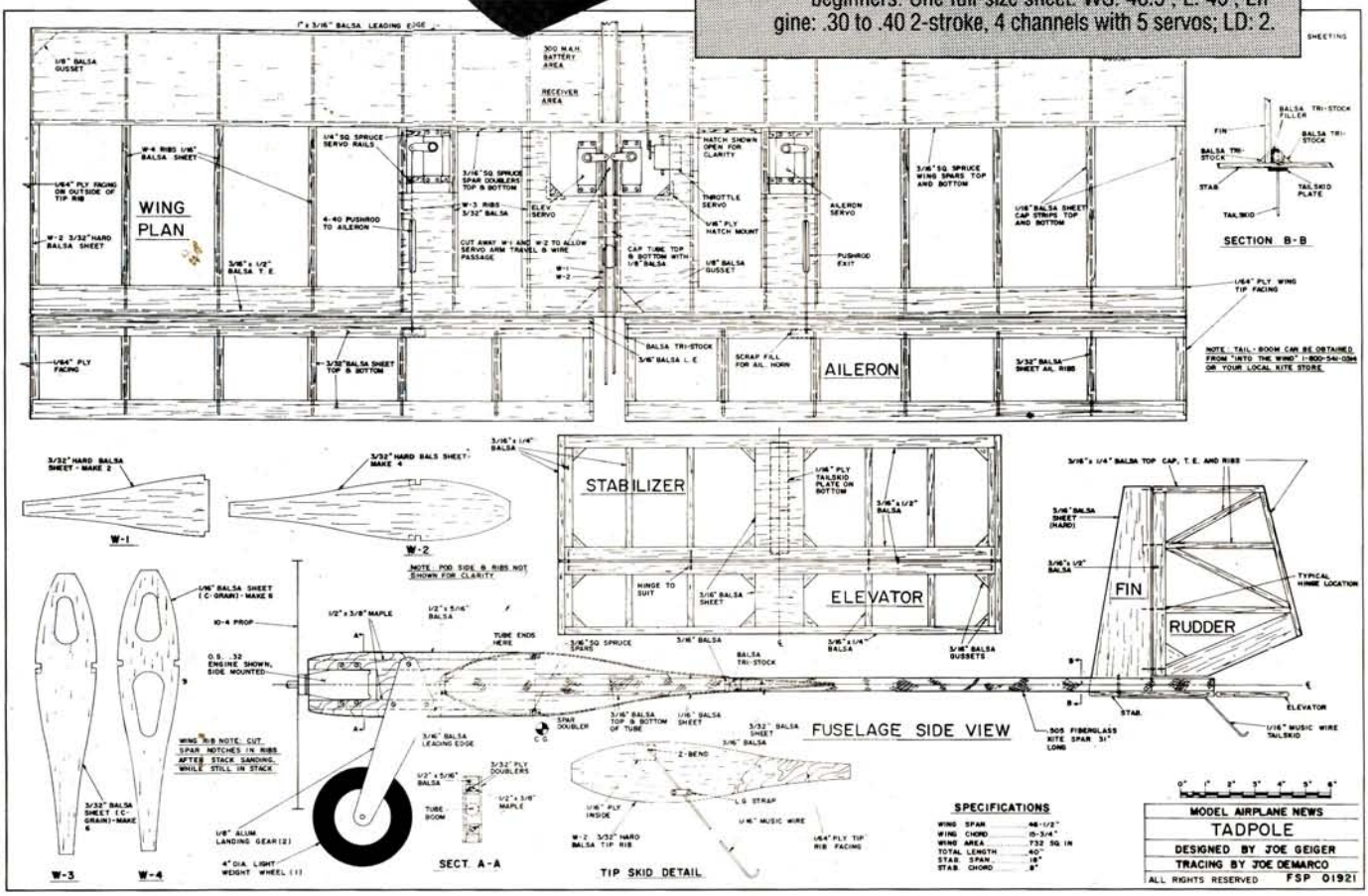


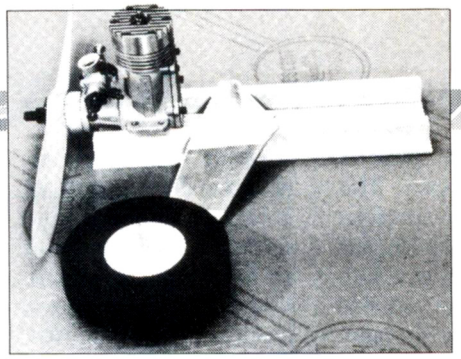
Right: all dressed up and ready to go. Note the reinforcement tape on the light foam wheel.

FSP 01921 TADPOLE $11

The Tadpole is a state-of-the-art fun-fly competition flier with a unique double-reflex airfoil to enhance slow-flight performance. It's built of balsa and plywood, and the tail boom is a fiberglass tube. Its very large control-surface deflections, light wing loading and computer mixing of the control surfaces make this light plane very maneuverable. It isn't for beginners. One full-size sheet. WS: 46.5"; L: 40"; Engine: .30 to .40 2-stroke, 4 channels with 5 servos; LD: 2.

ORDER THE FULL-SIZE PLANS ... PAGE 132





The distance between the bearers is determined by the size of the engine. The wheel placement prevents the plane from bumping the prop on touch-and-goes. The lightweight, but powerful, Fox .40BB Deluxe requires that you shorten the pod by about 1 inch to get the CG right.

The model is built flat on the workbench with no dihedral. Finish the top sheeting and capstrips before you remove it from the bench. A 48-inch level was used as a shim for the trailing edge.

to 1 inch). Be sure that you don't cut it too short to provide enough space for the landing gear and that there's enough space between the prop arc and the front wheel. Fill in around the boom with scrap balsa, and make sure that the boom is absolutely straight and on the center line you've drawn; then close up the pod with the remaining ply side. Lightweight booms can be purchased from Into the Wind.*

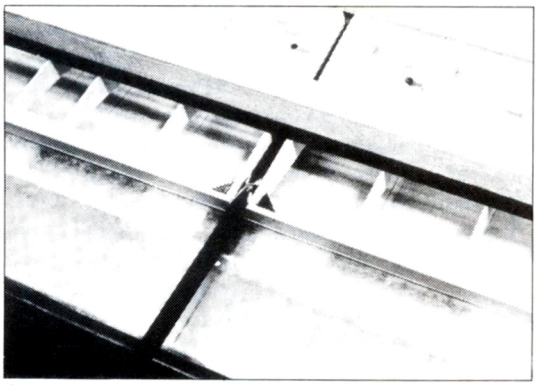
Drill your landing-gear holes; and drill a small hole in the side of the pod and boom if you want to run your antenna down the boom. Alternatively, run the antenna through the left wing and out through the tip; this will keep it away from the metal pushrods that run along the top of the boom.

• **Wing.** Shim the bottom spar up from the work table by 1/16 inch, and install the pod-and-boom assembly in the center of the spar, making sure it's absolutely square. I use a 48-inch level as a support for the boom and the trailing edge of the ribs; you may have to shim this to get it to exactly the right height.

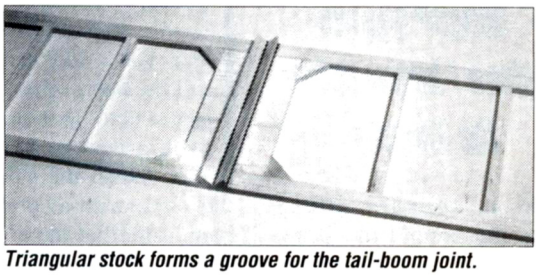
Install the ribs, the top spar, the trailing edge, the leading edge and the gussets in that order. Fill between the center ribs above the boom with a scrap of 3/16-inch balsa; then complete by sheeting and cap-stripping—weighting and pinning sheeting on it. Again, pin and weight the structure during the entire process so that you don't build in any twists or warps.

There are no shear webs in this wing, and I urge you not to add them. This wing should be light and flexible, and the shear webs will make it heavier and stiffer. I recommend that you glass the center section of the wing, but don't use resin to do this. Thin CA will fix the glass cloth nicely without adding the weight of resin.

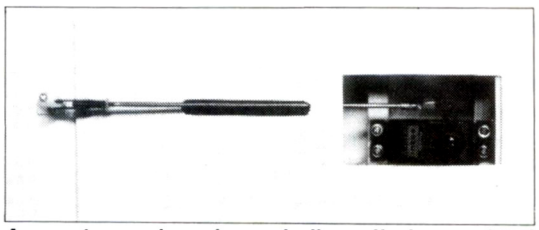
The ailerons are assembled directly over the plans, and they're of conventional built-up construction. Note that they're built of 3/32-inch sheet; not 1/16-inch, like the wings. Put a block of scrap between the lead-



Gussets are added before closing up the trailing-edge sheeting. To keep everything aligned and straight, the wing boom and trailing edge are shimmed up from the workbench. Weights are used to prevent warping.



Triangular stock forms a groove for the tail-boom joint.



A separate servo is used on each aileron. Hardware and 4-40 pushrods reduce slop. Non-programmable radios require a Y-harness; with programmable radios, you plug one servo into the aileron position and one into the flap position on the receiver. A strip of tape serves as a hinge for the radio hatch, and two small screws hold it closed.

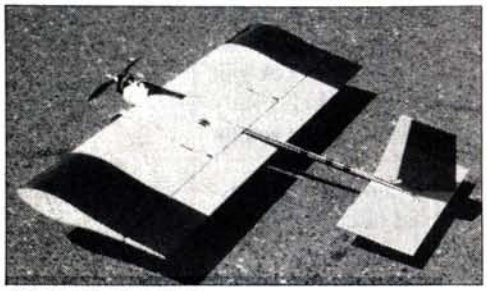
SPECIFICATIONS

Type: ..... Competition fun fly
Wingspan: ..... 47 inches
Wing chord: ..... 16 inches
Length: ..... 39 inches
Weight: ..... 3.5 pounds
Wing area: ..... 752 square inches
Wing loading: 10 to 11 oz. per square foot
Wing length: ..... 39 inches
Stab span: ..... 18 inches
Stab chord: ..... 8 inches
Fin height: ..... 8.25 inches
Fin width: ..... 7 inches average
Power Req'd: ..... .25 to .40 2-stroke
No. of Channels Req'd: ..... 4 (elevator, rudder, throttle and ailerons)

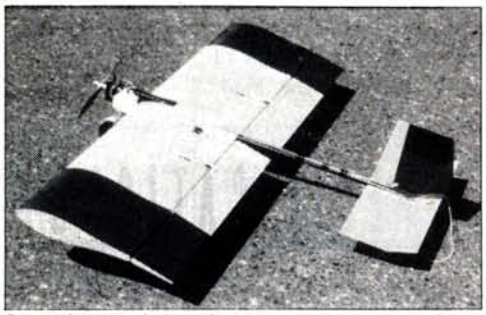
Features: the lightweight pod-and-boom fuselage and special double-reflex wing provide ultrahigh-performance competition ability. The ailerons each have their own servo (a total of five servos).

Comments: depending on the set-up, the Tadpole is outrageously responsive or docile. Computer radios afford considerable advantage in competition, but they're not necessary for sport flying. More pure fun than any other type of model, many pilots claim they get spoiled by the abilities of this plane. Yes, I know it's ugly, but when you fly it, you may never go back to your pretty planes.

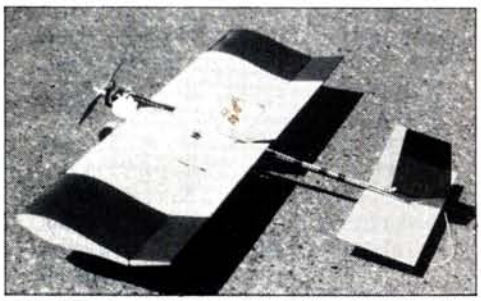
ing-edge sheets where the control horns will be mounted, and harden this area by poking pinholes in it and filling them with thin CA. Triangular stock is added to the leading edge after the rest of the structure has been completed, thus forming a perfectly shaped 45-degree leading edge. Hinge the ailerons to the wing using easy hinges, and leave a 1/32-inch gap between the wing and the aileron. This gap will be closed when you cover the wing. Install the aileron servos in the wing, using 1/4-inch spruce rails to mount them. If the ribs are at all soft where the rails join them, stiffen them with CA or a small amount of scrap balsa. These servos do some hard work, so I recommend the coreless, ball-bearing, contest type of servo and 4-40 pushrods. There's no access hatch to these servos, but it's a simple matter to cut the covering above them and replace it with a patch if access is needed later. Don't forget to run the wiring into the radio compartment before covering, or you'll be cutting the access hole sooner than you think.



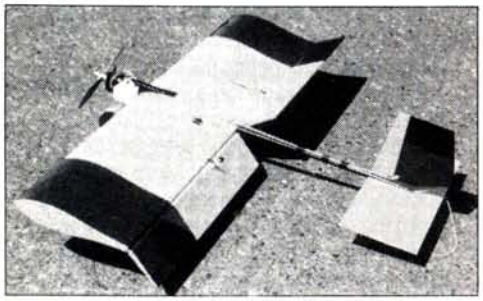
All controls at neutral.



Borrowing a technique from a control-line stunt, down-flap is mixed with up-elevator for tight, smooth looping.



Deploying the spoilerons will result in a parachute-type of descent. Use this feature if you get too high (over 50 feet).



The full deflection of the ailerons is approximately 45 degrees. This results in a roll rate that's best described as a blur.

• **Tail group**. The stab, elevator and rudder are all built directly over the plan. Be sure that you follow the grain directions shown and that the fin is cut out of a good, hard piece of balsa. Triangular stock is used to join the stab to the boom. Shape the tri-stock by wrapping some sandpaper around a section of boom material and running this over the stock until it takes on the shape of the boom. Alignment is critical; there's no dihedral to help you out on this plane, so it had better be straight if you expect it to do tight loops without wandering. Note that the fin is installed on the *side* of the boom, which puts it slightly off center. This results in a stronger mounting for the fin, and the slight offset won't affect flight. The tail-skid mount is made by laminating 1/16-inch ply, leaving a 1/16-inch gap in the lamination to trap the 1/16-inch music-wire skid.

• **Covering.** Cut out the radio hatch before you cover the Tadpole; then begin by covering the hinge gaps. Use bright, contrasting colors in large, simple patterns, and make sure that the top pattern is completely different from the bottom. When rolling, the Tadpole becomes a blur, so the top and bottom must be entirely different if you expect to maintain orientation or recover at the end of multiple rolls.

I put broad, chordwise stripes on the top, and broad, spanwise stripes on the bottom of all my contest planes. Over time, I've become so accustomed to this that I can stop upright and level almost all the time, but I'd be in real trouble if I flew someone else's Tadpole with spanwise stripes on the top! To get the covering to follow the airfoil, it's important to first stick it to the capstrips before shrinking the areas between the ribs. Once the covering has been attached to the capstrips, let it cool completely, then shrink the open bays with an iron (not a heat gun). Be careful! If you get too much heat near the ribs, the covering may come off them, and it may be very difficult to re-attach.

"Even my Yard Dart and Stickit have become hangar queens since I began flying the Tadpole."

RADIO INSTALLATION

To get the most out of the Tadpole, it's best to use a programmable radio, but don't despair if you don't have one, because the performance will still be outrageous without flaperons, spoilerons and elevator/flap mixing. To keep the weight down, use a 250mAh or a 300mAh battery for competition; or, for sport flying, there's plenty of room for a 500- to 600mAh pack.

The rudder, elevator and throttle servos are mounted with servo-mounting tape. I know that some of you don't trust this stuff, but if it's properly applied, it provides the lightest mount and is completely reliable. It won't stick tightly to bare balsa, so you must fill the balsa where the servo is to be mounted with a coat or two of CA. Clean the side of the servo with alcohol to make sure that there's no trace of oil from your skin on it, and completely cover the side with mounting tape before you touch it again. Then, take off the paper backing and mount the servo to the filled balsa. The only way you'll get it off will be by slicing through the tape, so don't worry. If you don't have exponential capabilities on your radio, start out with milder

throws; even if you do, it's probably best to start out with milder throws as a precaution. For competition, I use 3 inches of travel each way on the ailerons, 1 inch each way on elevator, and 4 inches each way on the rudder. See the separate section on radio programming if you're going full bore with a programmable set.

FINAL STEPS

You can either bend the two landing-gear legs to clear the sides of the wheel, or you can install 1/4-inch shims between the pod and the legs and leave them straight. Mount the landing gear, tail and wing-tip skids, and strap a 2-ounce tank to the pod side opposite the engine (put a chunk of foam rubber under it). You may be tempted to use a larger tank, or to enclose it in the right-wing leading edge; but in the majority of contests, you won't even use half the fuel in the 2-ounce tank, so why carry the extra weight of unnecessary fuel around with you?

As far as enclosing the tank is concerned, it does clean up the aircraft a bit; but it's very convenient to fly by yourself at walking speed during practice and check your fuel level, so I prefer the externally mounted tank. When the plane is complete in every other respect, put a prop on your engine, and strap it in place with some rubber bands. Slide it back and forth until you get the desired CG location, then mount it permanently. You're ready!

PERFORMANCE

Beware! Flying the Tadpole can be addictive. The incredible responsiveness of this specialized aircraft can ruin the appeal of flying most other types of plane. I've sold most of my pretty planes, and the ones that are left rarely get flown. Even my Yard Dart and Stickit have become hangar queens since I began flying the Tadpole.

If those huge control surfaces have you worried, start out with mild control throws and work your way up to full deflection. You'll be amazed how effortlessly a lightly loaded wing and powerplant can fly. This isn't to say that this is a beginner's ship; it most certainly is *not*. If, however, you're a reasonably competent pilot, you

(Continued on page 104)

PROGRAMMING YOUR TADPOLE

Even though the Tadpole will give you amazing performance with a standard radio, it has several features that can only be used with a programmable transmitter. These are: flaperons, elevator/flap mixing, spoilerons and exponential throws. The settings presented here are for Futaba's* 7UA series; however, the same features can be obtained with other programmable radios.

FLAPERONS

Plug the left wing servo into the aileron position in your receiver (no. 1), and the right wing servo into the flap position (no. 6). The flap trim knob should be set on "0." Enter FLPR programming mode and turn the on/off/inhibit icon "on." Use 100 percent in both directions. Verify that both ailerons are centered on the boom. They can both be lowered or raised with the flap trim knob.

ELEVATOR/FLAP MIXING

Enter 2-6 programming mode and place the mix switch in the upper (2-6) position. The screen should now blink "on." I use -35 percent flap with up-elevator, which results in 3/4 inch of down-flap with full up-elevator. If your events include many outside maneuvers, you may wish to use some up-flap with down-elevator, but I leave mine set at 0 percent.

SPOILERONS

Some pilots prefer to mix their spoilerons with low throttle, but I prefer to have mine separately controlled by the gear switch. If you accidentally go to low throttle while doing a low, slow inverted limbo and the spoilerons deploy, the results will be disastrous. Run a rubber band from the gear switch to the trainer-cord dust-cover strap, so that there's tension that keeps the switch in the rearward position when not in use. This will provide an automatic shutoff for the spoilerons when the switch is released. Enter PMX-1 programming mode and turn the P. MIX switch on. Select 5 as your master (MAS) channel, and 1 as your slave (SLV). Set your percentage at approximately -50 percent, or whatever figure raises the left aileron about 1 3/4 inches when the gear switch is held forward.

Now enter PMX-2 programming mode. It should be blinking "on." Select 5 as your master channel and 6 as the slave. While holding the gear switch forward against the pull of the rubber band, enter a percentage that will raise the right aileron the same amount as the left. When you release the gear-switch lever, both PMX-1 and PMX-2 should return to "0."

EXPONENTIAL

The amount of exponential you use is largely a matter of personal taste, but I urge you to reduce the sensitivity of the ailerons around center if you use full competition throws. I use -60 percent on them. I also find it useful for spot landings to use -40 percent on throttle, because it provides delicate control in the low-throttle range. You may also want to soften the rudder and elevator around center, but I prefer linear control on these.

Above: Futaba's 7UA Series computer radio, or its equivalent, allows you to get the most out of the Tadpole. This picture shows a low-tech addition to a high-tech radio: a no. 64 rubber band is run from the gear switch to the strap on the trainer cord dust cover. By using the gear switch as master and the programming spoilerons as slave, you can achieve spoileron control independent of the throttle switch.

Improve Performance by Reducing Drag

PART 1 • by ANDY LENNON

IT WILL COME as a surprise to most modelers (and some model designers, too) to find how much *air resistance*, or drag, their miniature aircraft generate in flight. The sources of much of it are such things as exposed or partially cowled engines; wire landing-gear legs; fat tires; dowels and rubber bands that are used to hold down the wings; large, exposed control horns and linkages; and thick trailing edges on wings and tail surfaces.

This doesn't imply that the models don't fly well; they do! In fact, the high drag is beneficial: it causes fairly steep glides—engine throttled—that make the landings of these relatively low-wing-loading models easy to judge. Their performance suffers in all other flight aspects, however.

This is the first of a three-part series: Part 1 deals with the causes of drag; Part 2 will partially cover drag reduction; and Part 3 will complete drag reduction and detail the "Swift"—a .46-powered model with slotted flaps that's designed for low drag.

Many years ago, *Model Airplane News* published a very significant two-part article by Hewitt Phillips and Bill Tyler, titled "Cutting Down the Drag." It was based on wind-tunnel tests conducted at the Massachusetts Institute of Technology Aeronautical Laboratory at model airplane speeds of from 15 to 40mph. The test models were 48 inches long and of typical model airplane construction.

Figure 1 summarizes the results, which are given in terms of their drag coefficients (C_D). The actual drag in ounces of a model fuselage depends on three factors:

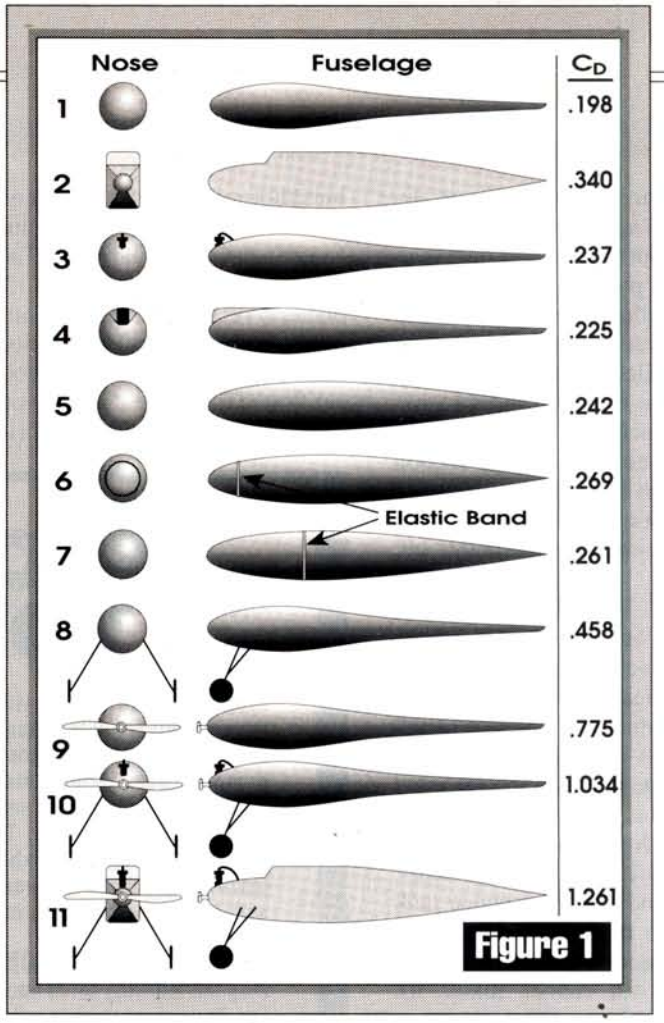
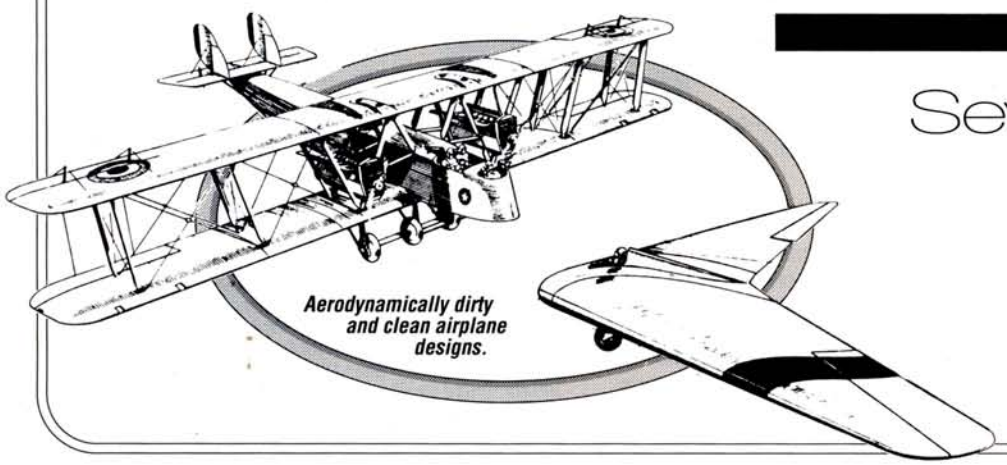


Figure 1

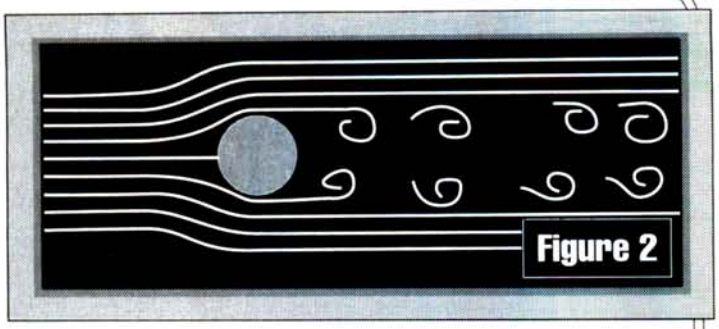
Drag Coefficients of Various Fuselages

The following formula permits calculation of drag in ounces based on fuselage shape and air speed. Where D=drag in ounces, A=maximum fuselage cross-sectional area in square inches and V=speed in ft./sec.: $D=[.00132]C_D x A x V^2$.



Aerodynamically dirty and clean airplane designs.

Several factors conspire to rob energy from your model



High-Drag Airflow Around Wire Landing-Gear Leg

- Air speed
- Cross-section area
- Shape of the fuselage

The C_D for each reflects the drag value of that shape. When used in a formula that includes cross-section area and speed, it will accurately provide the actual drag in ounces. For our purposes, the C_D provides the relative drag value of each shape. Analysis of the C_D's in Figure 1 will provide some surprising results.

Deducting the .198 C_D of fuselage 1 from that of fuselage 8 (.458) gives a C_D of .260 for the landing gear only—or more than the drag of fuselage 1. This gear was 1/8-inch-diameter music wire, and the wheels were the thin, symmetrical, cross-sectioned type that was popular at the time. Current tricycle landing gear with their large, fat tires would, conservatively, double the C_D to .520—or more than two-and-a-half times that of fuselage 1.

Deducting the .198 C_D of fuselage 1 from that of fuselage 9 (.775) provides a C_D of .577 for the stationary propeller. From fuselage 11's C_D of 1.261, deducting the prop C_D of .577, the landing gear C_D of .260 and the .340 C_D of fuselage 2, results in the exposed engine-cylinder drag of C_D .084. A fully exposed engine, muffler and firewall would, conservatively, have a C_D four times as great: .336.

Fuselage 11, which is 48 inches long and 33 square inches in cross section, looks representative of many of today's fuselage shapes. From its C_D of 1.261, deducting the prop C_D of .577 and adding the *extra* drag of .260 for tricycle gear/tires and of .336 for the fully exposed engine, results in a worst-case C_D of 1.28. At 40mph, this would generate a 19-ounce drag; at 50mph, a 30-ounce drag. SURPRISED? This *doesn't include wing and tail-surface drag*. A good drag-reducing design could lower this to a C_D of .38 (5.7 ounces) at 40mph but, again, this *wouldn't* include wing and tail-surface drag.

Fuselage Diameter as a Percentage of Fuselage Length for Least-Drag Circular Fuselages — **Figure 3**

This chart permits accurate scale construction of the fuselages depicted in Figure 1.

Station	Fuselage No. 5	Fuselage No. 1
0%	0.0000%	0.0000%
5%	0.0475%	0.0750%
10%	0.0660%	0.0980%
20%	0.0920%	0.1130%
30%	0.1080%	0.1030%
40%	0.1130%	0.0750%
50%	0.1030%	0.0520%
60%	0.0900%	0.0390%
70%	0.0710%	0.0325%
80%	0.0490%	0.0250%
90%	0.0250%	0.0180%
100%	0.0000%	0.0000%

Figures 2 and 4 from Phillips and Tyler's article illustrate the high drag caused by unfaired landing-gear legs. Figure 4 provides data for reproducing the fuselages 1 and 5 shown in Figure 1.

TYPES OF DRAG

Here's a list of the various types of drag and their causes:

- **Skin friction.** This is proportional to the amount of exposed surface area and its roughness as well the Reynolds number (R_N) at which the model flies. The smooth, reflexed, pressure-recovery shape of fuselage 1 in Figure 1 has the least surface area, and this contributes to its low drag.
- **Interference drag.** This is caused by the breakdown of smooth airflow owing to such things as landing-gear legs, bracing struts, dowels, open cockpits, etc., that disturb the airflow over the aircraft aft of the cause. (Figure 5 gives examples.)
- **Separation drag.** An example of this is a thick, low wing on a round fuselage. The air has to expand from the high point of the wing to the trailing edge and also fill the re-entrant corner formed at the trailing edge and the lower fuselage. The resultant turbulent flow causes high drag and reduces tail-surface effectiveness. The cure is wing-root fairings, e.g., those on the Spitfire, but they're difficult to make.
- **Wing and tail-surface profile drag.** These are similar to skin-friction drag and depend on the shapes of the airfoils and on the R_Ns at which they fly.

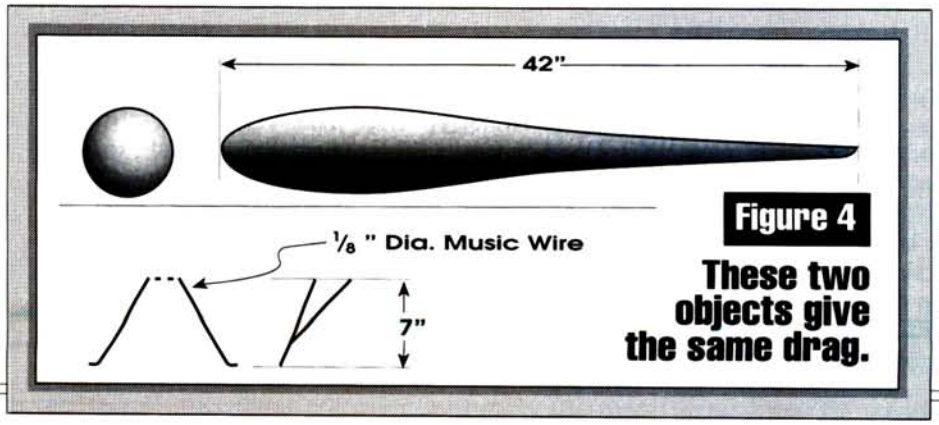
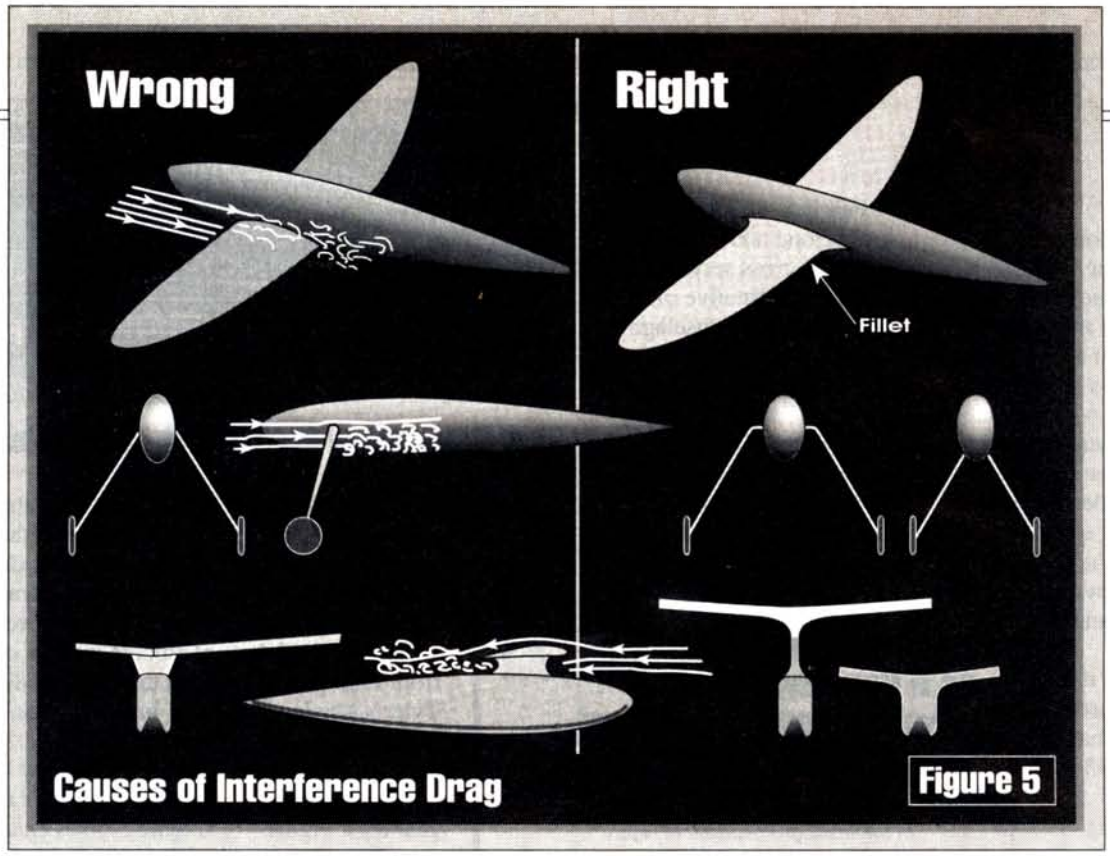


Figure 4

These two objects give the same drag.



Causes of Interference Drag — Figure 5

The R_N is easy to calculate. At sea level, R_N = chord (in inches) x speed (in mph) x 780. For example, a wing with a 10-inch chord flying at 40mph is at R_N 10x40x780 = 312,000.

● **Induced drag.** This results from the production of lift, and it depends on several factors: the wing area, the wing-aspect ratio, the wing planform, the flight speed and the lift coefficient at which the wing (and the tail surfaces) operate. It's normally less than the wing-profile drag.

● **Powerplant drag.** This is caused by exposed engines, cylinder heads, mufflers and tuned pipes.

● **Trim drag.** Consider a 100-ounce model, which has its CG 1 inch ahead of its wing's center of lift. A nose-down moment of 100 inch/ounces results. To maintain level flight, the horizontal tail must lift *downward*. Using a tail-moment arm of 25 inches, that download would be 100 ÷ 25 = 4 ounces.

To achieve this negative lift, the horizontal tail surface must be at a negative angle to the wing's downwash; this would result in increased induced drag. Since that extra 4 ounces must be supported by the wing, its induced drag also increases.

There are other forces that cause nose-up or nose-down actions and, to achieve level flight, the horizontal tail must overcome the net resultant force.

● **Wing-pitching moment.** This is a nose-down moment, except for symmetrical or reflexed trailing-edge sections, which have little or no pitching moment.

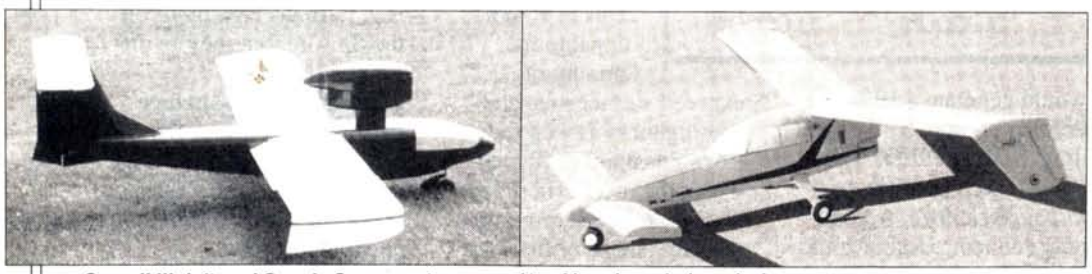
● **Upwash/downwash.** In level flight, air doesn't flow horizontally onto the wing's leading edge, or from its trailing edge. Ahead of the wing, the air flows upward to the leading edge (called upwash) and downward off the trailing edge (downwash).

Upwash causes a nose-up force on the fuselage ahead of the wing and on the propeller, because air flows into the propeller disk at a slight, upward angle. Downwash impacts on the aft fuselage and on the horizontal tail surface, and it causes a nose-up action.

● **Thrust-line location.** If it's above the CG, it produces a nose-down couple; below the CG, a nose-up couple.

● **Center-of-drag location.** If it's above the CG, it causes a nose-up force; below the CG, a nose-down force.

Parts 2 and 3 of this series will discuss ways to improve your model's performance by reducing the various forms of drag.



Seagull III, left, and Canada Goose are two examples of low-drag airplane designs.

MODEL AIRPLANE NEWS • CONSTRUCTION PULL-OUT •

THE Gnat

WHEN I originally decided to build a small sport/pattern-type aircraft, it was for several reasons. At the time, fuel was virtually unavailable in our area; I didn't have much balsa wood on hand; and I was fed up with having to disassemble my larger airplanes just to transport them in my Volkswagon beetle. I wanted a plane that would be quick and easy to build, wouldn't require an abundance of material, wouldn't cost much to operate and would be a real joy to fly. The Gnat certainly fills the bill.

SMALL SPORT/PATTERN DESIGN THAT'S BIG ON PERFORMANCE!

SPECIFICATIONS

Type: Sport pattern
Wingspan: 36 inches
Length: 31½ inches
Weight: 24 to 26 ounces
Wing area: 234 square inches
Wing loading: 14.8 ounces per square foot
Power req'd: O.S. Max .10
No. of channels req'd: 4 (throttle, aileron, elevator and rudder)

The author's son, John, shows off the new Gnat. There's no cowling, so adjusting the engine is a snap.

Features: the Gnat uses conventional balsa and plywood construction methods, and it isn't hard to build. The fully symmetrical wing has building tabs so it can be built flat on the workbench. An O.S. Max .10 with a 7x4 Master Airscrew was used in the prototype—an excellent choice for the Gnat. A 7x4.5 Top Flight prop was also used with good results. I've tried a .15 engine, but it's too heavy and has too much power for the model. (Not recommended!)

Comments: the Gnat is inexpensive to build and operate and easy to transport to the flying field. It has a predictable stall (straight ahead) and, with the control deflections shown on the plans, it's a joy to fly. A micro-size radio is required.

PHOTOS BY JOHN VAN'T-HAAFF

by JOHN VAN 'T-HAAFF

CONSTRUCTION

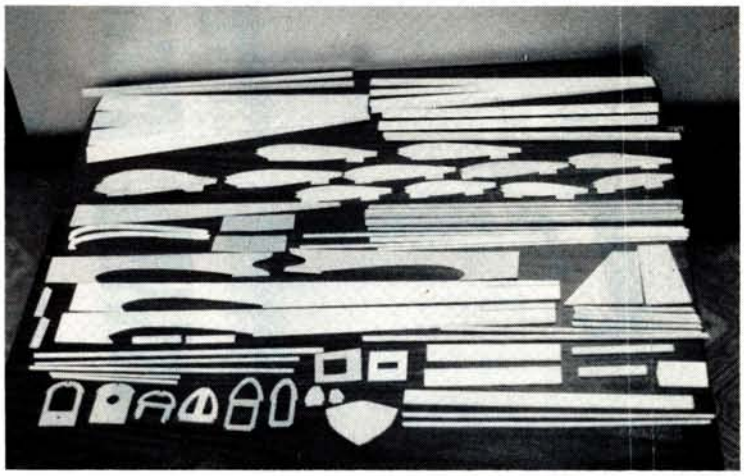
The Gnat's construction is fairly straightforward, and all incidences are set at 0 degrees. First, lay out the wood and cut out all the pieces. To check that the ribs are symmetrical, reverse the rib pattern over each rib after laying it out on the 1/16-inch sheet. Since the wing section is fully symmetrical, this task is quite easy. It also helps if you draw the center line on both the pattern and the rib stock. The inside of both R-2 ribs should be laminated with 1/64-inch ply.

TAIL GROUP

Cut the fin and rudder out of sheet stock according to the plan. I reinforced both sides of the rudder and the elevator with 1/64-inch ply (feathered at the edges) where the horn would be mounted. I also added ply to the opposite side to reinforce the joint between the elevator halves and the joiner. Control surfaces are tapered as a matter of course. On an aircraft of this size, it may not be aerodynamically significant, but it's more aesthetically pleasing.

WING

If you don't have a jig, use the building tabs, and build the wing directly on top of the plan on your building board. This should automatically give you 1 1/2 degrees of washout. To help set the angle of dihedral when the two wing panels are joined, set R-1 at 1 1/2 degrees. (The gauge provided on the plan will help.) Once you've aligned the ribs over the plan, insert the upper and lower 1/4-inch-square spruce spars. Check the alignment of the leading edge to the ribs, adjust as required and glue into place.



To save time, cut out all the parts before you start to build.

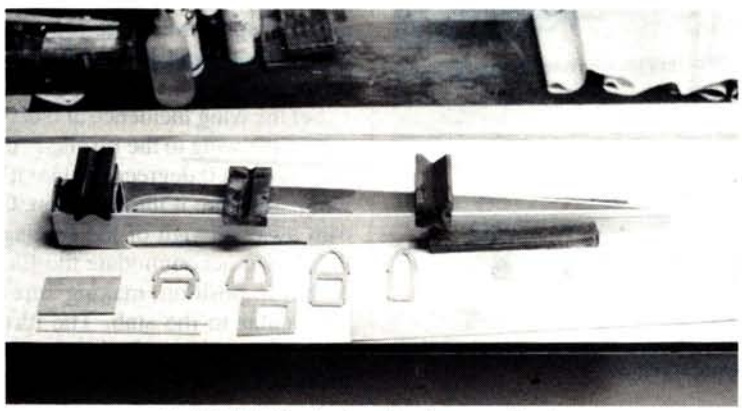
To ensure a proper fit for the 3/16x1/4-inch trailing-edge stock, sand the trailing edges of the ribs and glue them into place. Add the fore and aft sheeting to the top of the wing, and add the cap strips. (To help prevent the wing from warping or twisting, it's a good idea to complete the top half of each wing section before removing the wing panel from the board.) Remove the wing from the board, and apply trailing-edge sheeting.

After the dihedral braces and the locating dowel have been glued in, carefully cut off the tabs forward of the spar, sand the ribs gently, and affix the sheeting as you did for the top side. Remove the rear tabs and sand as required. Complete both panels in the same manner, and join them to produce the dihedral indicated on the plan. Sheet the wing center section between both R-2s with 1/16-inch balsa on both the top and the bottom.

To accommodate the servo before you sheet the top, install the servo tray near the wing top surface where indicated, and trim out the two center ribs. When you install the dihedral braces, mark the spar where the rib meets it both fore and aft. Carefully cut from the bottom of the rib to the top in a straight line (you'll cut through R-1 and R-2). Don't puncture the top sheeting. Slip the 1/64-inch ply brace into position. Realign the ribs with the marks and glue them into place. Repeat this procedure for the other side.

With a piece of sharp tube, carefully cut a hole in the wing leading edge where both panels join. Insert the 3/16-inch dowel, and be careful to align it with the center line marked on the sides of R-1. Install lite-ply or hard balsa bracing, and complete the sheeting as you did for the top side.

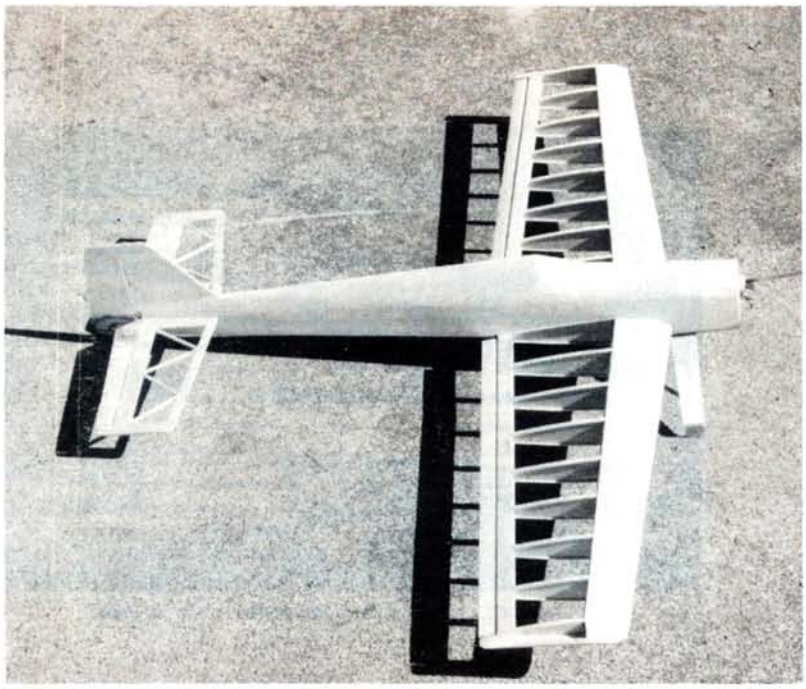
When you final-sand the wing leading edge, leave the center fairly sharp, and begin rounding between F-5 and F-6 so that the tip will be noticeably round. (This helps to maximize stability at low speeds.) The ailerons should be beveled on the leading edge. I use Goldberg's* no. 401 1/16-inch strip aileron horns for aileron control, and I hinged each aileron with two Sonic-Tronics* "easy" hinges. I attached the wing to the fuselage with a 10x32 nylon wing bolt .



Weights hold the fuselage in place over the plan.

FUSELAGE

The fuselage is also built over the plan. Before assembly, glue the 1/64-inch-thick ply doubler to each side, and install the 1/8-inch wing-saddle doubler over the top

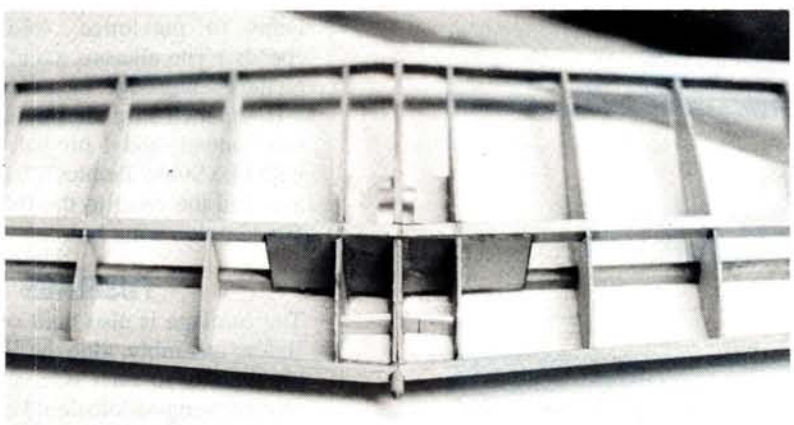


The completed airframe ready to cover.

I've had excellent results flying the Gnat with an O.S. Max .10 engine, a 7x4 Master Airscrew fiberglass prop or a Top Flight 7x4.5 wooden prop.

of the ply. Mark the former locations before you begin assembly. At this point, I like to add the triangular 3/8-inch balsa reinforcement pieces and the 1/8-inch-square bottom stringer. (Remember to build a left side *and* a right side.)

Begin by gluing F-1 and F-2 to one of the fuselage sides, and make sure that they're perpendicular. Now position the sides over the plan, using weights to hold everything in place. When the glue has dried, chamfer the tail ends of the sides so that they join as shown on the plan. Holding the assembly in place, add the remaining formers, check for alignment, and glue them into place. When the glue has set, remove the fuselage from the plan and invert it. Add the skid-attachment plate to the rear.



Shown here is the center section of the joined wing halves. The alignment dowel and ply braces are installed before the top sheeting.

Before applying the bottom sheeting, add the 1/16-inch-thick ply fuselage bottom from F-5 to the rear of the plane, and install the fuselage bottom gear-mounting plate between the firewall and F-2. The turtle-deck triangle stock and sheeting and the forward sheeting and windshield are added only after the tail group has been secured (after the wing has been fitted to the saddle).

Note that F-7 and F-8 aren't full-length formers. They extend only from the stiffener to where the triangular top stringer is attached to them. After the tail has been secured in place, the 1/4-inch triangular stringer can be joined to the top of the formers and faired into the fin leading edge. To determine whether shims are required, check the height of the formers with a straightedge, and sand them with a straight block if they're too high.

MATING THE WING

Carefully fit the wing on the fuselage, and adjust the saddle as required. Prior to covering, fill any voids with balsa strips or filler. When the wing is square with the fuselage's center line, pilot-drill through the mounting tab and into the bottom of the fuse; then disassemble the fuse. Install a 1/8-inch-thick ply doubler behind F-5, inside the 1/16-inch-thick ply bottom, and drill and tap for the mounting bolt.

Drill the wing tab to accommodate the mounting bolt, and re-join the wing to the fuse. Before completing the sheeting, insert a couple of pieces of 3/8-inch triangular scrap between the top of the wing leading edge and F-2, and glue them to the rear of F-2.

Set the wing incidence at 0 degrees and secure the wing to the fuselage. Install the stab, set it at 0 degrees, square it with the wing, and glue it into position. Carefully trim away enough of the fuselage above the stab to accommodate the fin, and secure it in position, making sure it's perpendicular to the stab. The turtle deck, forward sheeting and windshield can now be installed.

LIGHT WHEELS

I made the wheels out of 1/32-inch-thick plywood, and I mounted O-ring tires on them. The wheels and the landing-gear combination are very light and create little drag. I don't recommend using wooden wheels on hard-top surfaces or dirt runways, but they're fine on grass. I've had three full seasons of flying with this aircraft, and I haven't had to replace the gear or the wheels. The plastic hub in the center is just now showing signs of wear. If you don't fancy making your own, Williams Bros.* wheels are good substitutes.

COVERING

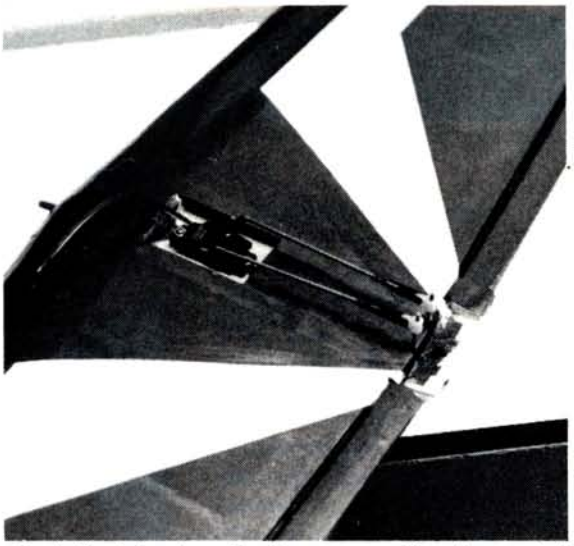
I covered the Gnat with white MonoKote* and Black Baron* red and blue metal-flake. It looks fine, but it's tricky to use iron-on materials that require different temperatures to apply them. Try to stick with one type of covering; your favorite will do. To improve performance, I recommend that you cover the control-surface gaps.

FLYING

Balance the aircraft carefully. The control deflections shown are recommended only for advanced pilots. The aircraft is very responsive to aileron control. Make sure that the elevator doesn't bind in the rudder and that the throttle servo arm clears the top of the wing.

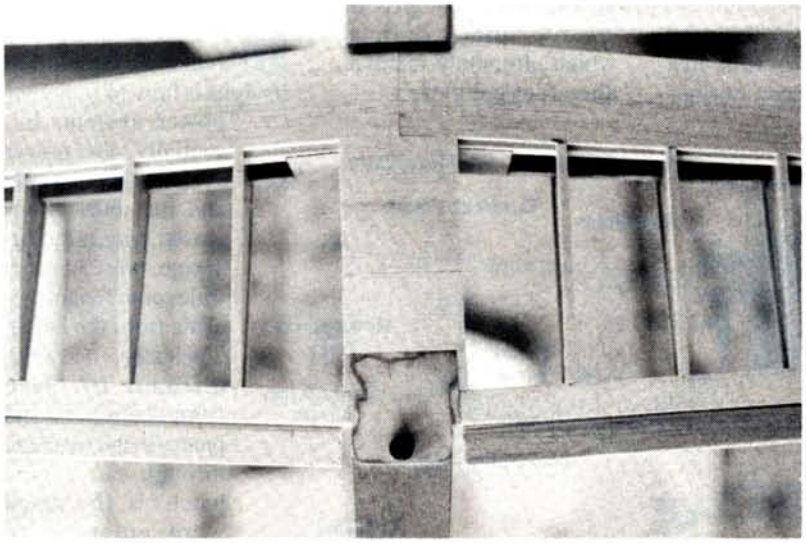
I've had excellent results flying the Gnat with an O.S.* Max .10 engine, a 7x4 Master Airscrew* fiberglass prop or a Top Flight* 7x4.5 wooden prop. The plane has quite a large flight envelope. If you're a pilot with intermediate skills, then you'll have a ball flying with the control deflection indicated on the plan. The plane has no nasty habits; stalls are straight ahead; and it tracks beautifully through all maneuvers. It flies as well inverted as it does right side up. I've also flown this airplane with an O.S. Max .15 and, although I had no trouble flying it, the larger engine increased power and weight too much, and landings were considerably hotter.

The plane's cramped quarters make micro-gear mandatory. Unless you have little or no patience, or you're all thumbs, this shouldn't present too much of a problem. Enjoy!



The finished wing shows the aileron servo and the aileron control linkage.

The plane has no nasty habits; stalls are straight ahead; and it tracks beautifully through all maneuvers. It flies as well inverted as it does right side up.



The underside of the wing with the plywood plate and the wing-mounting bolt.

Here are the addresses of the companies mentioned in this article:
***Carl Goldberg Models,** 2828 Cochran St., Simi Valley, CA 93065.*
***Sonic-Tronics,** 7865 Mill Rd., Elkins Park, PA 19117.*
***Williams Bros.,** 181 Pawnee St., San Marcos, CA 92069.*
***MonoKote;** distributed by Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.*
***Black Baron;** distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044.*
***O.S./Great Planes Model Distributors,** P.O. Box 4021, Champaign, IL 61824.*
***Master Airscrew;** distributed by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401.*
***Top Flight Models,** 2635 S. Wabash Ave., Chicago, IL 60616.*

JET BLAST

TOMCATS, FUEL SYSTEMS AND A CONTEST

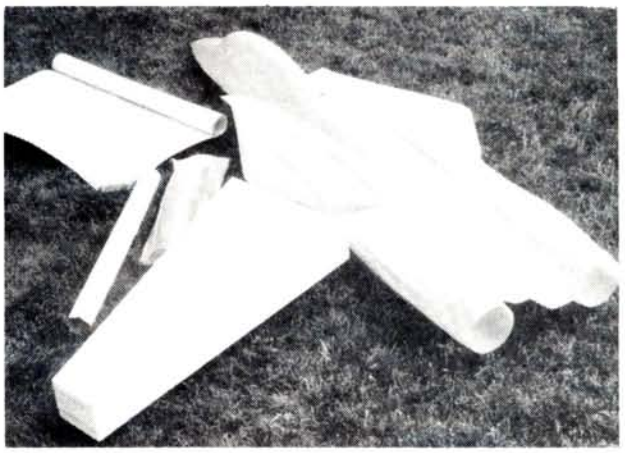
by GEORGE LEU

HOBBY BARN* is the exclusive U.S. importer of Philip Avonds' F-14 Tomcat plan set. This 1/10-scale version of the venerable Navy fighter is a real showstopper, and it features a swing-wing mechanism, rotating retracts and ordnance that can be realistically fired in flight.

The set consists of seven sheets of full-size drawings and includes instructions on how to fabricate the many intricate parts for the above-mentioned features. The design is recommended for the experienced modeler who has access to a lathe.

As an alternative, *Model Airplane News* offers a 1/10-scale version of the F-14 Tomcat. Built out of balsa, this Tom Hunt design also has a swing-wing mechanism. This plan set is recommended for advanced builders and poses a number of challenges.

DCU* and Jet Hangar Hobbies* also offer limited production kits of the Tomcat in 1/10 scale. Both kits have an epoxy/glass fuselage, foam wing-cores and a canopy. There are no templates, plans or instructions; however, since the 1/10-scale size is common to the designs mentioned above, enterprising modelers could make their own F-14 kits by purchasing the plans, fuselages, wings, etc. It's certainly something to think about.



The fuselage, wings and canopy of the DCU F-14 Tomcat are in 1/10 scale.

HEADING FOR THE "MAX"

Sometimes, people who are starting out in ducted fans ask me to recommend a radio. Though there are many good radios on the market, I think JR's* Max computer radio is one of the best values for ducted-fan fliers.

The radio is designed with an LCD screen that lets you program surface movements using numbers, e.g., it allows you to determine the percentage of movement of a stabilizer surface. Another useful feature is the incorporation of both dual-rate and exponential control on the rudder, the aileron and the elevator channels. Since most jet aircraft travel faster than 120mph, this feature allows for very precise control-surface settings, which ultimately make an aircraft easier to fly.

It's also possible to mix any two channels using the programmable free-mix function. If you have a Delta design, e.g., an F-106 or a Mirage, that uses elevons to fly, you'll find this function invaluable and a lot easier to use than a separate servo-mixing device.

FUEL SYSTEMS FOR YOUR JET

One of the problems inherent in all ducted-fan designs is how to fuel your power system. Essentially, the power system (the engine and fan unit) is enclosed within the fuselage, which leaves little room for access, aside from the hatch. Typically, it's very difficult to place component parts and pieces in the fuselage through the engine hatch. If the hatch were enlarged to accommodate the

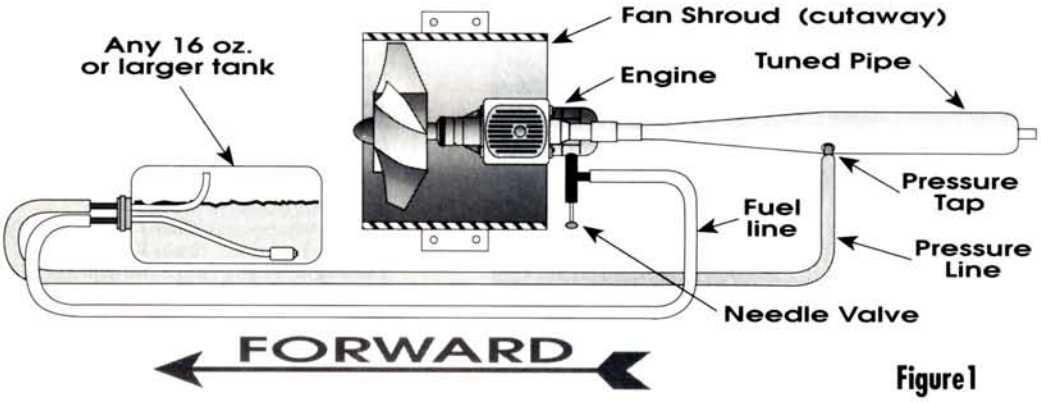


Figure 1

placement of all the necessary parts, it might weaken the fuselage. The air flow, both in and out of the fan, is normally conducted through thrust tubes, and this tends to prevent the mounting of parts and pieces in front of or behind the fan unit.

There are jet models on the market that do place equipment in front of the fan unit, e.g., Byron Originals*. These kits don't use an intake thrust tube per se. Although not as efficient as those that feature an intake liner, i.e., tube, these designs rely on the awesome power of today's fan units and engines to bring air into the fan unit through auxiliary air inlets.

A fuel system designed for this setup is identical to that found in any propeller-driven aircraft. The tank faces forward, but is located in front of the power unit. My only advice to someone using this setup is to tie down the fuel lines running to the engine, or the pressure line from the tuned pipe, so that they don't become entwined with the fan blades. (See Figure 1.) If there's no auxiliary air inlet, fuel tanks are often placed in the fuselage front section, either alongside or directly in front of the fan.

Today, Bob Violett Models*, Yellow Aircraft & Hobby Supplies* and Sullivan Products* all offer saddle tanks that are designed to fit along the fuselage's side between the exhaust liner and the outer fuselage shell. (The precise location is entirely up to the modeler.) The tanks' contour is designed to conform with fan units that are 4½ to 6 inches in diameter.

The saddle tanks are available with a fuel capacity of either 9 ounces or 11 ounces. By placing two 11-ounce tanks (one on each side of the liner) in the aircraft, you'll have 22 ounces of fuel—a quantity that gives you a safe flying time of at least 12 to 15 minutes on .77 to .82 engines. Tuned-pipe pressure is recommended when you use two saddle tanks. (See Figure 2.)

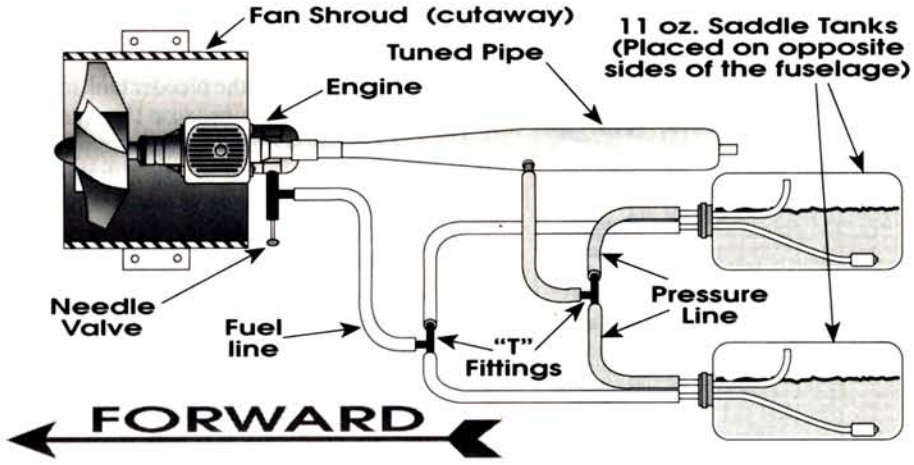


Figure 2

To pressurize my fuel systems, I tap into the tuned pipe with a fuel-tubing pressure fitting. By doing this, I ensure that the position of the tanks isn't as critical in relation to the engine. As a rule, I like to keep my fuel tanks close to the plane's CG and in line with the engine's height as viewed from the aircraft's side.

If your tanks are above the carburetor, they may produce a siphoning action and constantly flood your engine. This would cause excessive backfiring when you start your engine and poor idling characteristics. Locating the tank below the carburetor doesn't seem to have much effect because of the pressurized system.

I've noticed jet fliers using bleeder tanks or header tanks that are close to their engines. This 2- to 4-ounce tank is always full because of the pressurized system. The tank's proximity to the engine also prevents fuel interruption that's caused by air bubbles or surging during the flight. (See Figure no. 3)

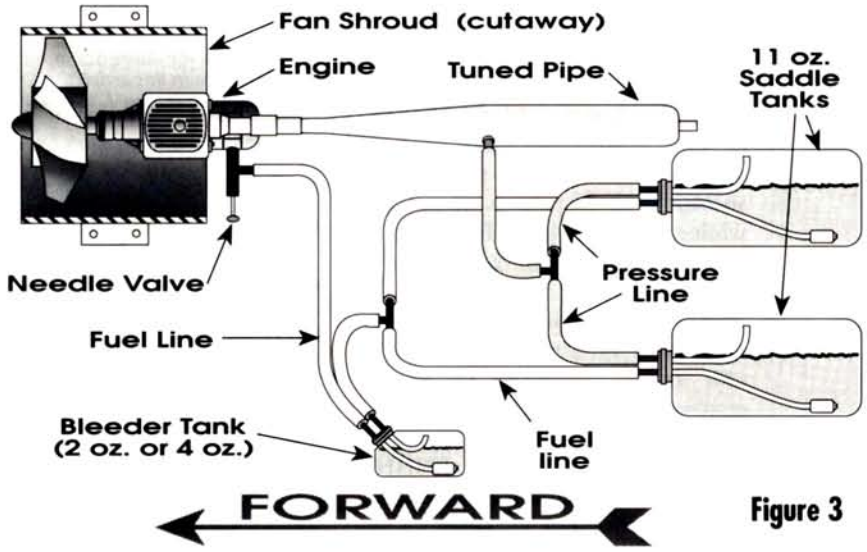


Figure 3

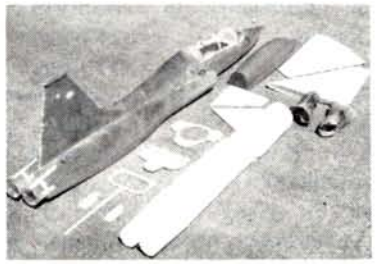
JET BLAST

I haven't used the bleeder tank in any of my aircraft, because I've had no problems with the standard setup. It does make sense to use it, however, and common sense is welcome with ducted-fan operation.

One note of caution with a bleeder tank: because of the tank's size, a small tank may be restrictive on its clunk. A short length of standard fuel tubing may not be as flexible, especially in a confined space. To prevent problems, you may want to use a more flexible fuel tube in the bleeder tank or use the larger 4-ounce tank.

FAN WITH NO NAME

Larry Wolfe of Jet Hangar Hobbies is developing a ducted-fan unit specifically designed for a .91 or larger engine. As of this writing, JHH is doing prototype testing with the unit in R/C aircraft. It uses the same size shroud and mounts as the Turbax III, but it has a new impeller and stator. It will fit in any aircraft that's designed for a Turbax III.



The T-38 prototype kit from Skyrider Models.

The fan's construction is similar to that of other fan units on the market. Static ground tests have shown 12 to 13 pounds of thrust, while developing 4.6hp. Exhaust air speed is over 200mph with the engine spinning at 22,000rpm.

The only problem JHH has had is deciding on a name for the fan unit. Larry has asked *Jet Blast* readers to help out by submitting to him (not to me or to *Model Airplane News*) a name for the unit. If JHH uses your name, you'll receive one of the production versions as a thank-you.

Hobby Dynamics' MAX PCM radio works well in ducted fans—computerized, quantitative control at a reasonable price.

SKYRIDER TAKES OFF

Ron Kemp of Puyallup, WA, has started a manufacturing company called Skyrider Models*. His first release will be a T-38 Talon jet presented in 1/6.4 scale (84-inch fuselage, 47-inch wingspan).

What makes this kit unique is that all the panel lines, hatches and scale detailing are pre-molded in the white resin epoxy/glass fuselage. The aircraft is powered by a Dynamax* or Viojett* fan unit. Ron has developed a patented, foam-filled, epoxy/glass wing-and-stab arrangement. The kit will be more like an ARF than a standard airplane kit.

Other jet designs will include an F-18 Hornet and an F-15 Eagle. The cost of the complete kits will be in the $600 range. Initial delivery is scheduled to begin in October 1991. I wish both Ron and his wife Trudy success with Skyrider Models.

**Here are the addresses of the companies mentioned in this article:*
Hobby Barn, *P.O. Box 17856, Tucson, AZ 85731.*
DCU, *1556 S. Anaheim, Unit C, Anaheim, CA 92805.*
Jet Hangar Hobbies, *12130G Carson St., Hawaiian Gardens, CA 90716.*
JR Propo; *distributed by Hobby Dynamics Distributors, P.O. Box 3726, Champaign, IL 61826.*
Byron Originals, *P.O. Box 279, Ida Grove, IA 51445.*
Bob Violett Models, *1373 Citrus Rd., Winter Spring, FL 32708.*
Yellow Aircraft & Hobby Supplies, *11919 Canyon Rd., Puyallup, WA 98373.*
Sullivan Products, *P.O. Box 5166, Baltimore, MD 21224.*
Skyrider Models, *11919 Canyon Road East, Puyallup, WA 98373; (206) 535-0116.*
Dynamax; *distributed by Jet Model Products, 304 Silvertop, Raymore, MO 64083.*
Viojett; *distributed by Bob Violett Models.*

NEW for '92

With one look at the products on these pages, it's obvious that the hobby is growing, and 1992 promises to be an interesting year with many new developments. Look for reports on these new products in the coming year.

by MODEL AIRPLANE NEWS STAFF

GOLDBERG • Extra 300

In recent years, Carl Goldberg Models has applied the unique, simple, lightweight construction methods that are so good for novices to stand-off-scale aerobatic subjects. First their was the Chipmunk; then an Ultimate Bipe; and now an Extra 300. The 68-inch-span model boasts a light wing loading that's right for any engine, from a 2-stroke .61 to a 4-stroke 1.20. This should be an excellent plane for "beginning, aerobatic wanna-be" pilots.

Price: $209.99

For more information, contact your local hobby dealer.

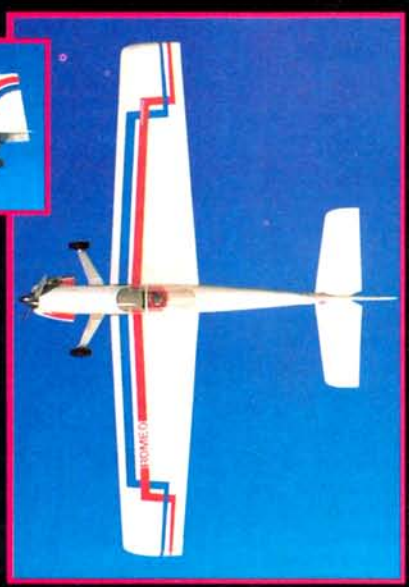
HIROBO • Bell 222

Joining the new Hirobo Scale Series are a .60 and .30 Bell 222 (.60 shown). Like the others in the Scale Series line, the 222 is realistically detailed with accessories like wipers, door handles and a scale cockpit area. It has retractable landing gear, is more than 62 inches long and has a main-rotor diameter of 61 inches. As we go to print, this product has yet to be given a price, but by the time you read this, Altech will have one for you.

For more information, call Altech Marketing at (908) 248-8738.

HOBBY LOBBY • Romeo

This sleek .40 to .61 sport/pattern ship from Hobby Lobby International has a 63-inch wingspan that has a high-aspect ratio for graceful performance. The Romeo has clean, aerodynamic lines because its engine is rotated 45 degrees away from inverted, and the tuned-pipe runs along a channel in the bottom of the fuselage. This high-quality all-balsa/ply Romeo is made in Germany by Rodel.



Price: $139

For more information, call Hobby Lobby at (615) 373-1444.

MINICRAFT • Sanders

The reasonably priced Minicraft orbital and bench sanders are specifically designed to make small sanding jobs less time-consuming and more enjoyable. The high-speed bench sander has a 90-degree miter guide, ventilated housing and holes that take screws so that you can bolt it to your workbench. The compact, light, orbital sander has a quick-release sandpaper grip, a fan-cooled motor and a retractable cable for better storage.

Prices: $56.95—Bench sander; $49.95—Orbital sander.

For more information, call Minicraft at (800) 288-5331.

ROBBE • Focus

Sure to cause a high degree of curiosity among slope-soaring enthusiasts is this 3-meter Robbe Focus. The kit features a ready-made Plura fuselage with molded-in fin and cabin flange and pre-sheeted foam wing-cores with pre-cut aileron wells, servo and air-brake wells and cable tunnels for the servo wires. Also included is a pre-sheeted tailplane and many other cut-and-shaped parts.

Price: $329

For more information, call Robbe Model Sports at (908) 359-2115.

ALTECH • Pilatus Porter PC-6

The Porter is an all-wood, almost-ready-to-cover, semi-scale version of a Swiss STOL utility aircraft. Although the scale and the size of the model (72-inch span) will excite both intermediate and experienced pilots, it's also good for novices. Weighing 6 to 8 pounds, with its 720-square-inch wing area and a strong .40 2-stroke in its nose, the Porter will fly almost like a trainer. For power, it requires a .40 to .60 2-stroke, or a .53-.80 4-stroke. This is another Altech product for which we have no price as we go to print, but you can call Altech.

For more information call Altech Marketing at (908) 248-8738.

KALT • Baron Alpha II

The new Kalt Baron Alpha II is a top-of-the line competition heli that was designed with FAI pilots in mind. It features a 35½-inch tail boom, a 9.78:1:5.4 gear ratio and a convenient, top, cone starter. The SII competition rotor head and competition tail gears are designed for performance, and the heavy-duty aluminum side frames are light, but durable.

Price: $999.99

For more information, call Hobby Dynamics at (217) 355-0022.

FLORIO STUNT WAGON

Form Follows Function

by ART SCHROEDER

Mild or wild? It all depends on the amount of throw you give the controls.

HERE'S A flying machine that can be wild or mild—one that's truly competitive in fun-fly events; and it's a performance sportster that will turn heads at local flying fields. Stunt Wagon may be short on looks, but it's a beauty in every other area.

Nearly 40 years ago, I competed regularly with a Stunt Wagon as designed by Hal deBolt. It was a purpose-designed, unusually styled U-control stunt model with tremendous performance potential. During the past few weeks, I built and flew another Stunt Wagon, this one designed by Jim Florio*.

It, too, is a purpose-designed, unusually styled model, but this time, it's an *R/C* airplane with tremendous performance potential. Though there's no link—other than name—between the two designs, I couldn't help but notice that Florio's Stunt Wagon looked as much like a Ukie as its namesake.

This design makes no pretense at being anything other than a model airplane developed for very specific purposes. There's no canopy, no "toy" pilot, no simulated details—nothing more than areas, moments, angles and throws to move the square airframe quickly around all three aerodynamic axes. The airframe itself is light and quite easy to build.

THE KIT

Several years ago, I reviewed the Florio Flyer, the first offering of the Florio Flyer Corp., so I knew what to expect of the materials and the parts fit. All parts are band-sawn and, with the exception of the rib/spar notches, which were too small, parts fit is excellent. The wood selection was also generally good, but the wing leading- and trailing-edge stock was rock hard, so final shaping was a little difficult.
(A block plane helped with this chore.)

Hardware is very limited: a beautifully bent landing gear; some wire wrap; and a length of music wire for a tail skid. The instructions are incomplete and clearly *not* intended for beginners—probably just as well, since the Stunt Wagon wasn't designed for novices.

PHOTOS BY ART SCHROEDER & YAMIL SUED

STUNT WAGON

The engine and fuel tank are mounted on hardwood rails. Everything sits in the breeze for ease of maintenance.

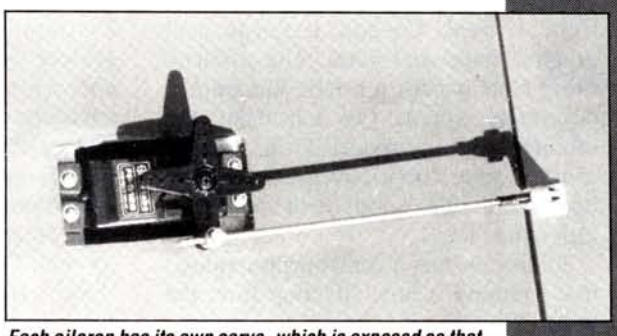
Building it isn't at all difficult, but a beginner would have his hands full once the wheels have air under them. There's an exception to both of those statements. The wing is built primarily of 1/4-inch spars and 1/16-inch sheet that requires an experienced hand to sand without breaking through the thin wood. On the flying end, with very limited surface throws, this airplane is so stable and has such a relatively slow flight speed that it's the best intermediate trainer I've ever seen—bar none! By the way, the instructions have been updated and should be in the new kits by the time you read this.

THE DESIGN

Stunt Wagon is a large, yet compact, very closely coupled airplane. Obviously, its 48.75-inch span (50 inches advertised) and short moments are used to limit travel inertia when starting and ending turns and rolls. Even though its wingspan is relatively short, it packs a whopping 775.6 square inches or 5 square feet of area (786 is advertised). The thickness of the fully symmetrical airfoil is 13-percent of the full (and huge) wing chord of 15.5 inches, or 17 percent of the fixed, airfoiled part. There's a lot of lift in that kind of wing area and volume.

The vertical stabilizing surfaces consist of only 11 percent fin and 89 percent rudder; elevator uses 77 percent of the horizontal stabilizer area. Clearly, the fin and stab are merely concessions to hinging the movable surfaces. The aileron/flaps (flaperons) use some 22 percent of the wing area. We're talking some very heavy-duty control surfaces here!; and these huge surfaces are thrown something near 2 inches (45 degrees) to each side of center (with the exception of elevator, which must be limited to 1 inch if you don't couple flaperons with it. Florio says the airplane can snap out of loops without coupling). You can believe that this airplane will loop, roll, or turn on a dime and give back change!

The plane's design depends on lightness. My Stunt Wagon weighed in at 3 pounds, 12 ounces, and this works out to a loading of 12 ounces per square foot—nearly glider-type specs. So, too, with its recommended .30ci power and an 11x4 prop, the design depends on relatively slow flight speeds. A propeller of this size (I could only find it in a Rev-Up*) gives limited forward flight speeds, solid acceleration and reasonable vertical performance. All in all, it's an airplane that moves forward at a relatively sedate rate but pitches and rolls with the speed of a bullet. How about 100 rolls over a few 100 feet of airspace; or 4-foot loops that can continue forever; flick rolls in an eye blink; spins more leaf-like than airplane-style—all this in a package that's easy to land and so stable you can do low passes under a snake's belly! Well, I like this bird so much that I can be excused at least one exaggeration!



Each aileron has its own servo, which is exposed so that it can be removed or adjusted quickly.

Getting ready for that unavoidable first flight. Low rates make the model a boxy J-3.

SPECIFICATIONS

(Manufacturer's specifications are shown in parenthesis)

Type: Fun-fly speciality stunt
Wingspan: 48.75 inches (50 inches)
Chord: 15.5 inches (15.5 inches)
Wing area: 755.6 square inches (786 square inches)
Weight: 3 pounds, 12 ounces (3 to 4 pounds)
Length: 40.5 inches (43 inches)
Wing loading: 12 ounces/square foot
Engine: 25ci to 40ci .32 (Webra Speed chosen)
No. of channels req'd: 4 (with 5 servos—for elevator, throttle, rudder and one for each aileron)
Suggested retail price: $59.95
Features: the Stunt Wagon has a basic construction of balsa, ply and maple. The kit features band-sawn parts and limited hardware and instructions, and the finished model is a competitive fun-fly entrant.

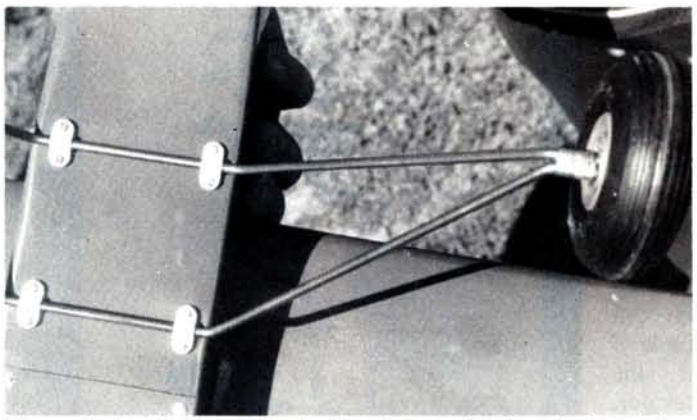
Hits:

- high-quality wood that's typical of Florio kits;
- well-designed, easy to construct airframe;
- use of dual rates will permit "wild" or "mild" aerobatic performance
- sizeable wing area and volume;
- light, low-pitch propeller;
- with reduced throws, it's an outstanding intermediate trainer.

Misses:

- rock-hard leading- and trailing-edge stock make final-shaping difficult;
- discrepancy between Stunt Wagon's advertised and actual measurements.

STUNT WAGON



The music-wire landing gear is simple and strong. The formed wire and the wire for binding the axle are included in the kit.

CONSTRUCTION

If you have at least one model in your background, you'll find the Stunt Wagon very easy to build. There's nothing here that you haven't seen before: a wing with two 1/4-inch spars and a D-tube sheeted leading edge with cap strips; a slab-side fuselage without doublers (3/16-inch sides); square formers and a simple, maple, beam mount; ailerons, elevator and rudder flat-stick construction; and a fin and stab of pre-cut sheet balsa.

The wing is built first and is done in one piece. I suggest that you shim the ribs to form a jig to hold everything in alignment when you add the trailing edge. The undersize rib notches are easy to enlarge, but you must remove material from the same spot on each rib—either front or rear of the notch. Working with 1/16-inch wood (ribs and sheeting) requires care, since it's fragile until all parts have been put into place.

The leading-edge sheeting was slightly warped, so I used a razor blade to cut off a bit of one edge to get a square gluing surface. I used Carl Goldberg's* Jet and Super Jet throughout the construction. One thing is most important: don't warp this wing! Work carefully and be certain that your building board is flat. With its huge chord, any twist in the wing will be accentuated and a devil to trim out!

The other surfaces can be built quickly. A razor saw will help ease the chore of cutting the rudder and elevator's numerous angles.

It took me only 7 hours to build the entire fuselage, from beginning to finish-sanding. It's a simple balsa box. Just be careful to make equal bends on both sides, from former 5 to the tail post—lest thy fuselage becometh a banana!

Stunt Wagon is a one-piece airplane, i.e., its wing is permanently glued into place (radio access is through a bottom hatch; indeed, the wing center section is the main radio compartment and standard equipment fits easily). I chose to cover all the components before gluing everything together, but you may prefer to join them first.

The plans call for a controlled tail skid, and this is fine for grass. Since I usually fly from a paved runway, I changed to a tail wheel. Florio Stunt Wagons have figure-8, stitched hinges, but Sig* Easy Hinges work well—four to each moveable surface. Other necessary items that aren't mentioned in the instructions include a 6-ounce Sullivan* SS-6 tank (it just fits the open tank area found in most Florio designs); 2.75-inch Sullivan Sky-Lite wheels (these foam-core, rubber-covered tires are excellent); Goldberg* short, 1/2A horns (longer ones aren't suitable); a Du-Bro* tail-wheel system; Sullivan Semi-Flexible plastic pushrods and, of course, the usual assorted couplers, clevises, collars—whatever.

I covered everything with Coverite's* Black Baron Red (still my favorite covering): two rolls did the job. For the trim, I used Coverite's Presto and graphics tape and stars. The airplane fairly cries out for a bright, but simple, decorating scheme. (To help them stay oriented with the model during fun-fly events, some fliers cover the top and bottom of the wing with markedly different colors.)

Joining the major components required that I remove a little covering from the wing, the stab and the fin to ensure a balsa-to-balsa connection. Before gluing, be sure that all surfaces are square and properly aligned. An extra pair of hands sure helps with final assembly.

When it's finished, the bird is really kind of neat-looking. Indeed, it's so functional, so bare of any racy lines, that it begins to take on a charm all its own.

RADIO

The Florios recommend that this airplane be flown with computer radios that permit mixing of elevator with flaperons for a coupled function and throttle to flaperons for spoilers. By mixing down-flaps with up-elevator (and vice versa), remarkably tight loops and other maneuvers are predictable. The flap/elevator coupling could be done with a mechanical mixer on a non-computer radio. It's only with the mixed functions that the Stunt Wagon's full potential can be realized, but it can still sparkle with more usual rigs.

Since my Futaba* radio was off at R/C hospital, I had to press my ancient (1975) Kraft Signature single-stick into service. The radio is the most reliable I've ever had, and it's newly updated, gold-stickered and joined with an RCD* Platinum receiver that I can't say enough about. This is one fine receiver! I also use five Futaba S-128 servos.

* * *

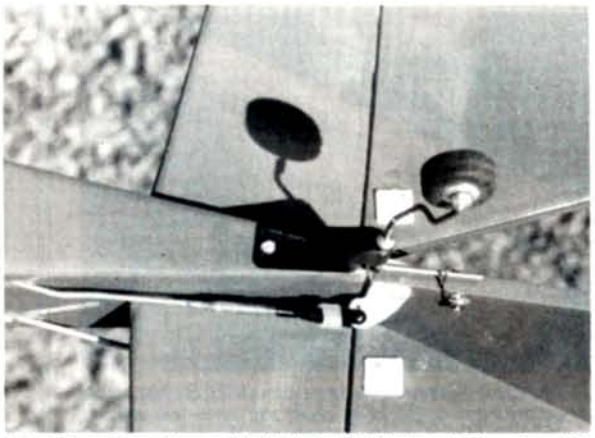
The airplane naturally drifted left; I naturally applied right rudder and was rewarded with an almost 180-degree turn. It was so quick that I was shocked (remember, no dual rate on the rudder), but I kept my "cool"—or at least as much "cool" as "old shaky" gets.

The Kraft has a wide swing on dual rates, so I set high rates at 2 inches up and down (measured at the rear of the aileron) and only 1 inch at low rate. I set elevator at 1 inch (up and down) at high, and at 3/4 inch at low; and rudder swing is a full 2 inches on either side. These throws are achieved with long Futaba output arms and short Goldberg control horns. Be advised that such throws give a spongy feel to the surfaces—not sloppy, just slightly springy. I thought I might see some flutter, but none appeared in flight tests. In any event, at high rate, I ended up with "wild," and at low rate, I had "mild." *[Editor's note: for more details on how to set up the Stunt Wagon with a*

computer radio, see the November '91 issue, page 54, for "Setting up Your Model with the Micropro 8000.]

ENGINE

The Webra* Speed 32 I installed proved to be an ideal choice. It's smooth, easy to start and powerful, and it has the most linear carb I've ever used. I can't attest to its longevity, but if it's like other Webras I've had, it will be around a long time. In this project, the Webra drank 15-percent pattern blend. It liked the brew!



The kit comes with a controllable tail-skid wire, but I replaced it with a tail wheel for use on paved runways.

The engine was the last thing I installed. If there's a slight balance problem, the engine can be shifted fore or aft to correct it. With the Webra installed, my balance point came at the middle of the suggested range.

By the way, my Stunt Wagon required 53 hours of work from box opening to flight-ready condition. I'm slow, so I'm sure many can better that time.

PERFORMANCE

After totally running out of excuses (I had many), I was finally forced by several friends to "get the show on the road." Not having the foggiest idea as to what might happen, I put both aileron and elevator at low rate. The engine was running well, I signaled release, and my "wild child" moved forward. The airplane naturally drifted left; I naturally applied right rudder and was rewarded with an almost 180-degree turn. It was so quick that I was shocked (remember, no dual rate on the rudder), but I kept my "cool"—or at least as much "cool" as "old shaky" gets.

I taxied back, lined up and applied throttle. The airplane drifted left, naturally, and I thought, "Right, that's enough!" Stunt Wagon was off and flying. One circuit around the field, and I realized that, at low rate, I had a very boxy J-3 on my hands. This thing was so easy to fly it was ridiculous. Loops were slow and easy, rolls were positive and not at all quick. I liked it! A number of low passes had me feeling I could put this bird anywhere.

WAGON WILDNESS

But I had a journalistic duty to report the wild part of this thing. Climbing 20 mistakes high (more or less), I switched to high rates. All I can say is, "Wow!". I did a roll series that was so rapid that I really didn't get corrective pitch into the sequence. Learning to really wring this bird out will take practice.

Tight consecutive loops were on the money with no incidental corrective control needed. Four- and 8-point rolls were also quite easy, albeit blindingly fast. I began to understand Florio's line, "not for the faint of heart!" I have a lot of work to do to "learn" this machine, but it all appears to be great fun in the trying. I can always switch back to low rates and get that boxy J-3-type airplane back.

This has been an enjoyable project and one that I highly recommend to anyone who's looking to get their adrenaline going. The Florios have now turned on the world's oldest fun-fly competitor. I can hardly wait to get my computer radio out of the R/C hospital to see what Stunt Wagon can do at the top of its game. Anyone for the inverted limbo event?

**Here are the addresses of the companies mentioned in this article:*

Florio Flyer Corp., *837 Johnsonburg Rd., St. Mary's, PA 15857.*

Rev-Up; *distributed by Progress Mfg. Co., P.O. Box 1306, Manhattan, KS 66502.*

Carl Goldberg Models Inc., *4734 W. Chicago Ave., Chicago, IL 60651.*

Sig Mfg. Co., *401 S. Front St., Montezuma, IA 50171.*

Sullivan Products, *1 N. Haven St., Baltimore, MD 21224.*

Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*

Coverite, *420 Babylon Rd., Horsham, PA 19044.*

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*

RCD, *9419 Abraham Way, Santee, CA 92071.*

Webra; *distributed by Hobby Dynamics Distributors, P.O. Box 3726, Champaign, IL 61826.* ■

HOW TO:

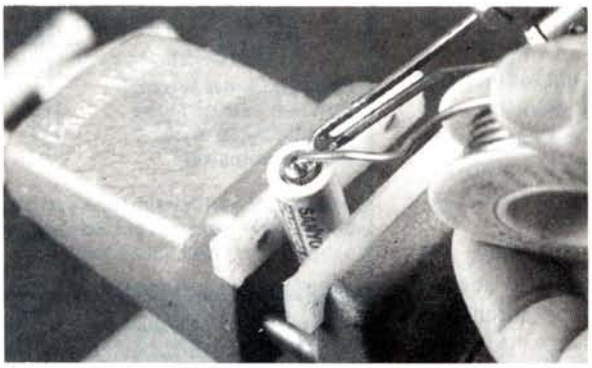
by RANDY RANDOLPH

MAKE A LIGHTWEIGHT ELECTRIC MOTOR BATTERY

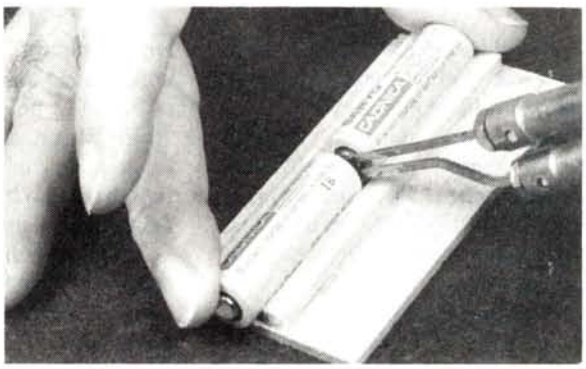
The photos show how to assemble an inexpensive, lightweight, 7.2V pack that will fly a small airplane for almost as long as an 800mAh pack, and it weighs 1 1/2 ounces less. The Sanyo Cadnica 600mAh cells work well in this application.

1. You'll need: six, 600mAh Sanyo cells, a 6-inch-long piece of 2- or 3-inch-wide balsa sheet, two 6-inch strips of 1/4-inch-square balsa, and two 1/2x3/16-inch metal strips cut from a tin can. (The cells show their fast-charge rate on their labels.)

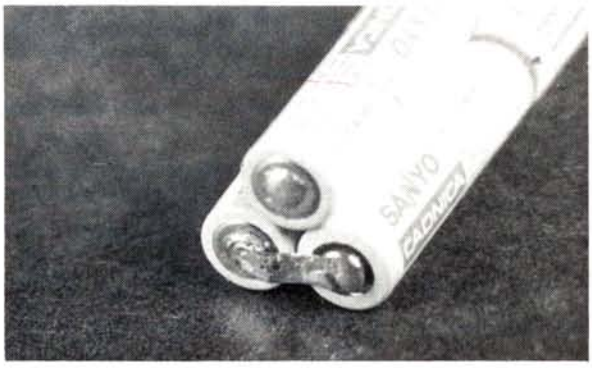
2. To hold the cells in alignment, make a jig by gluing the two pieces of 1/4-inch-square balsa to the balsa sheet and using two cells as spacers. The cells should fit snugly between the strips, yet you should still be able to slide them smoothly along the channel.



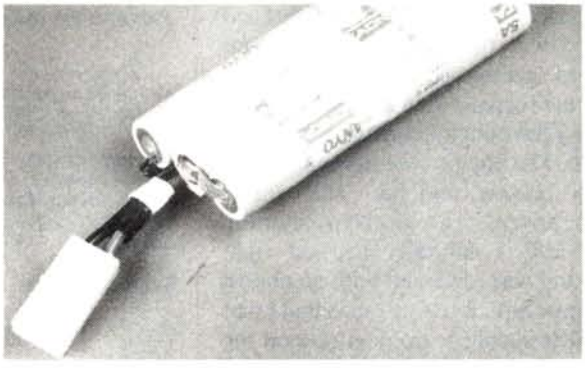
3. Tin the ends of the cells with solder. (I recommend a 60-40 solder because it melts easily.) If you hold the cells in a vise, cushion them with foam, and apply only very gentle pressure.



4. To join two cells, put them in the jig. (They should be positioned so that the positive end of one touches the negative end of the other.) To join them, insert the soldering iron so that the solder on their ends melts together to form a bond. Make three sets of two cells.



5. Join the three sets of cells in series by soldering on the two metal strips. Join one positive end to a negative end, and leave one positive and one negative end unconnected. The cell groups can be joined in a triangle (as shown), or assembled flat.



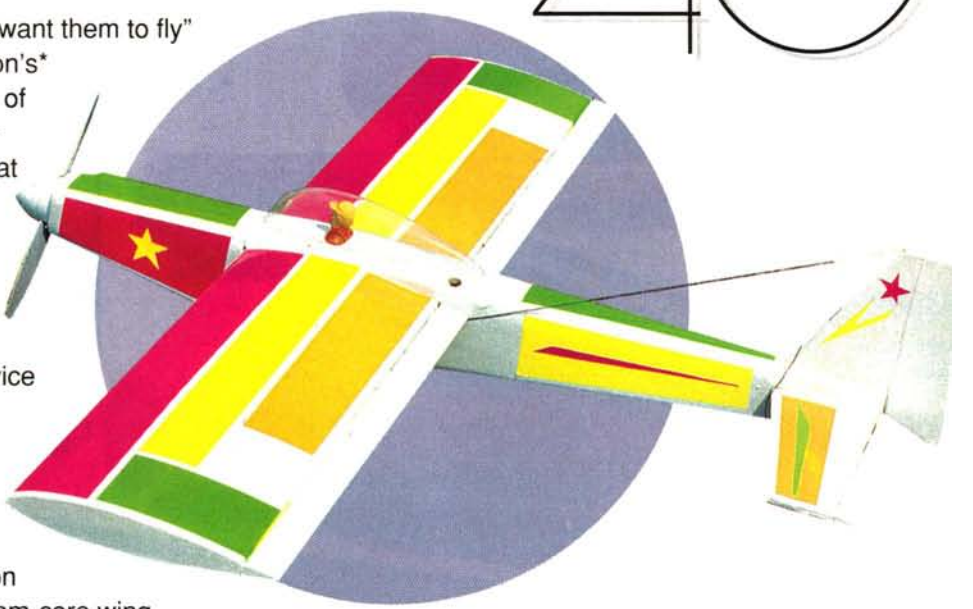
6. Solder the connectors that match your motor installation to the open terminals—red wire for positive; black for negative. A 2-amp charge rate will charge the cells in 20 minutes.

The student stunter's stepping stone

C A R D E N

Maverick 40

"WE KNOW HOW you want them to fly" is Carden Corporation's* motto for its fine line of R/C models. Although it's a relatively new company, the people at Carden not only know how we want our models to fly,but they also know how we want our models to be built! The Maverick .40 is an intermediate sport model that will challenge the novice and please even the most discerning modeler/flier.



THE KIT

In the kit, you'll find full-size, rolled plans, a 20-page instruction booklet filled with photos, two foam-core wing halves, a very generous hardware package, a beautifully polished main gear and lots of

by TYGE O'DONNELL

top-grade balsa and ply. So far, so good.

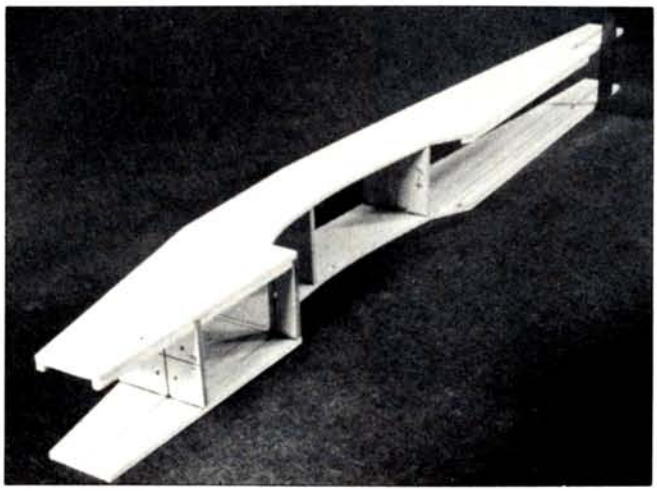
FUSELAGE

The fuselage is of conventional box-type construction. Owing to its depth, the 1/4-inch sides are in two pieces (upper and lower), so you'll have to butt-glue the parts and sand them. With an overall length of 43 inches and a wingspan of 56 inches, the Maverick is of average proportions for the recommended .40-size engine. On the plans, the firewall's position is shown for a 4-stroke engine. Since I decided to use a Merco* .50 2-stroke, I relocated the firewall (this allowed me to use a larger fuel tank). I

The plane has a unique and painless wing-dowel installation.

then installed formers 2, 3 and 4 according to the plans. Former 3 is in the middle of the radio compartment with its bottom cut open. Can you believe that the people at Carden did this so that your battery and servo wires can be routed through this former without a hassle?

To finish the fuselage, add triangle stock to the body and pull the tail sections together. Add the 1/4-inch top sheeting with the 1/8-inch cross-grain bottom sheeting, and you can start sanding and planing. Because of the 1/4-inch top sheeting and the triangle stock in the corners of the fuselage, you must grease the elbow to obtain the turtle-deck radius.



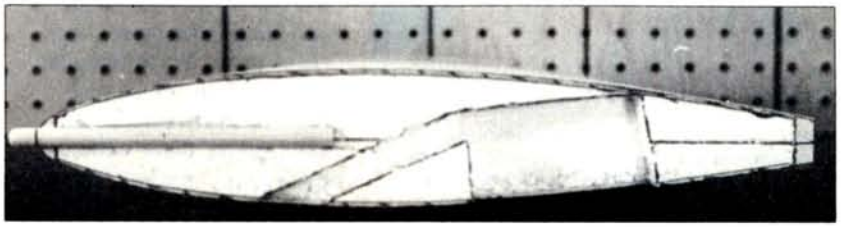
Quarter-inch balsa slab sides, four formers and no doublers make this fuselage assembly easy.

At first, I was concerned about the fuselage's weight. Most of the body is made of 1/4-inch balsa; in my opinion, that's overkill. I think that 3/16-inch balsa would have been sufficient. Because so much 1/4-inch balsa is used, however, the fuselage is very sturdy, and I removed most of the unnecessary weight with a balsa planer and a final sanding.

You'll have to butt-glue the fin and stab, which are also of 1/4-inch balsa and in two pieces. On the bottom of the rudder is a piece of hardwood through which the tail-wheel wire can be inserted. To obtain a nicely tapered control surface, I used a balsa planer on the elevator halves and the rudder, and then I sanded them.

WING

The wing halves are of high-quality, virgin-density foam. I didn't see a ripple or a dip on the surface. Although the symmetrical airfoil that's used isn't shown on the plans, it's very thick, and its high point is nearly in the middle of the chord! I sheeted the halves with the supplied 1/16-inch balsa. I made a large sheet for each quarter panel by taping the edges of three small sheets together and then running a thin bead of CA along the seams. Then, I then coated the wing half and the sheet with Southern R/C Sorghum* and laid the sheet gently on the foam. The wing halves spent the night with a few cinder blocks atop them to ensure a good,



Cut out the wing-dowel slot and the servo bay before you join the wing panels.

SPECIFICATIONS

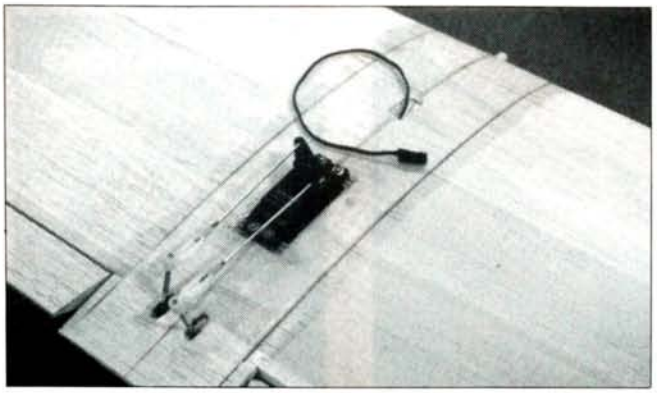
Type: *Sport/stunt trainer*
Length: *43 inches*
Wingspan: *56 inches*
Weight: *6 pounds, 6 ounces*
Area: *630 square inches*
Wing loading: *23.3 ounces per square foot*
Power req'd: *.40 to .45*
No. of channels req'd: *4 (ailerons, rudder, elevator, motor)*
Sug. retail price: *$79.95*
Features: *top-grade, band-sawn parts; full-size rolled plans; 20-page instruction booklet; foam wing-cores; polished landing gear; and full hardware package.*
Hits:

- *photo-filled instruction booklet;*
- *ease of construction and parts fit;*
- *large flight envelope;*
- *general aerobatics capability coupled with good slow-flight characteristics make this a good aerobatic trainer.*

Misses:

- *low-profile fuselage results in poor knife-edge ability.*

Maverick 40



The wing has easy foam-core wing construction and straightforward servo installation.

firm bond.

After the sheeting had dried, I added the leading and trailing edges along with the wing tips. Because the wing is constant chord, completing it took very little time. I joined the wing panels (no dihedral) using epoxy and coated the center section with the supplied fiberglass. I aligned the wing to the fuselage and drilled the wing-bolt holes.

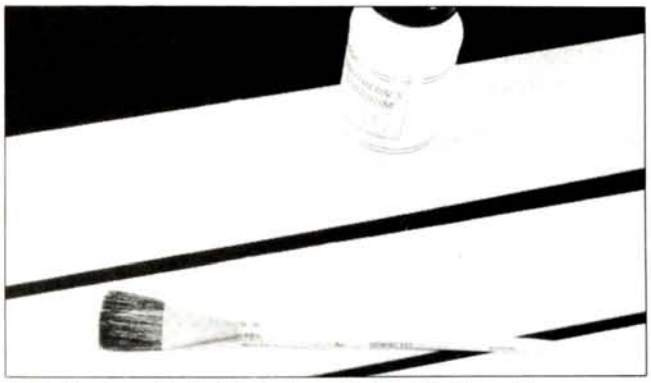
FINISHING

I sanded the whole airframe once more before I covered it with Hobby Lobby's* Oracover. The base color is white, and I added an assortment of fluorescent colors for trim. I bonded Oracover to all the plane's surfaces, not just to its edges. This method is ideal for strengthening sheeted wings. I installed a Futaba* 4-channel radio, bolted on the polished aluminum landing gear and glued the canopy using PFM adhesive. I installed a Merco .50 in the front. Although the Maverick is designed for a .40 engine, the Merco .50 is about the same size and weight as most .40 engines. A Graupner* 12x6 prop was used on the initial flights. Because Merco engines are long strokes, they can swing larger props.

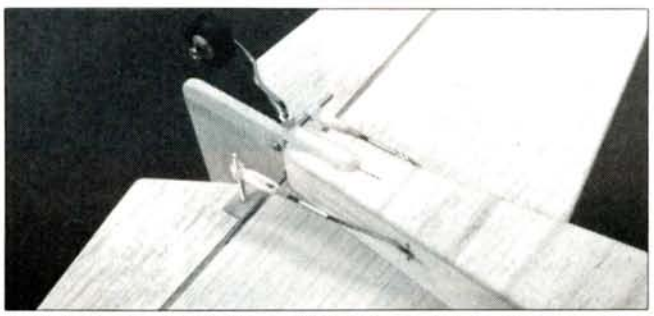
FLYING

It was hot and hazy when I headed to the flying field, and a slight breeze blew from the north at approximately 8 to 10mph. I range-checked the radio and double-checked all the control movements. Another check of the CG proved it to be right on; there was nothing left to do but fly. The Merco .50 started on the first flip, and the smell of castor oil filled the air. I taxied around the runway, turned into the wind, punched the throttle and the plane was off the ground in 50 feet. The only trim required was a little right rudder and a fair amount of down-elevator. After a few passes, the Maverick was trimmed out and ready for the real tests! The Maverick .40 will give you the snappiest snap roll, the slowest slow roll and the roundest loop you could ever want from a sport plane. Although the it's supposed to be capable of knife-edge flight, mine just didn't want to stay "on the edge." I even cheated by pulling into a slight climb before entering the maneuver. If the rudder and fin area were increased, perhaps knife-edge flight would be possible (although, given the relatively small fuselage, this might just "hang" the plane more on its prop). If you keep the CG at the manufacturer's recommended point, you can land the plane without even a hint of a stall. The blunt leading edges help to slow the plane, so landing it is more manageable for less-experienced fliers. What more can I say? The Maverick .40 is more than I expected!

At $79.95, the Maverick .40 is a good value for those who want an all-around great flier. Many of my flying friends weren't very excited about the plane's looks, but after seeing it fly, they all took a liking to it. I really think that the Maverick .40 would be a great kit-bashing subject (add a turtle deck, and you'd have a decent, sport-like Laser 200). The Maverick .40 is fun to build and fun to fly. Carden Corp. has obviously taken its time with this one.



Butt-glue three sheets of balsa for each side of the foam wing cores, then use Southern R/C Sorghum to glue the balsa to the cores.



The 1/4-inch balsa-sheet tail group fits into the precision, router-cut tail slots perfectly. Cover the fin and stab with film, join them, and then slide them into the covered fuselage (as a completed unit) during the final assembly.

**Here are the addresses of the companies mentioned in this article:*

***Carden Corp.**, 1731 NW Madrid Way, Boca Raton, FL 33432.*

***Merco**; distributed by Hobby Lobby International.*

***Southern R/C Sorghum**; distributed by Southern R/C, 4560 Lay High Rd., Hamilton, OH 45013.*

***Hobby Lobby International**, 5614 Franklin Pike Cir., P.O. Box 285, Brentwood, TN 37027.*

***Futaba Corp. of America**, 4 Studebaker, Irvine, CA 92718.*

***Graupner**; distributed by Hobby Lobby International.* ■

1991 COMPETITION

FUN-FLY NATS

The Most Agile Aircraft Go For The Gold

by BOB HASTINGS

LAST AUGUST, at the 1991 Competition Fun-Fly Nats, some of the best R/C fliers met to duel it out in the skies over Alabama. Best?—I'll qualify that statement by asking you to take your favorite ship out to the field to see if you can come even close to the times posted at this year's contest.

Overall winner David Grantham of Georgia.

Nearly $12,000 in prizes and the promise of intense competition drew 71 top R/C fliers from all over the United States and Canada. This type of competition flying, born in the highly competitive southeastern U.S., is relatively new to R/C. Five factors determine whether or not you'll be among the winners: you, your plane and three judges armed with stopwatches. This year, pod-and-boom planes were flown by all but three people, and most of the engines used were .28 to .40 size.

Friday was a day of unpacking the equipment and becoming accustomed to the field. A field was also set up at a local college so that people could practice. Perhaps "practice" is the wrong word—intimidation might better sum it up! The practice flying was spectacular. One of the hottest pairs of thumbs at the contest belonged to Harold Parker. He reduced five of his seven airplanes to little more than a pile of balsa and composite tail-boom shrapnel. Dinner, held at the field, was provided to all contestants by the members and families of the Northern Alabama Radio Control Association (NARCA).

Thirteen-year-old David Schlabach on his way to a 2nd-place finish.

SATURDAY'S QUALIFIERS

Saturday morning, the weatherman called for a high-pressure system to move into the area. That's exactly what was brewing! The 9 a.m. pilots' meeting, led by Contest Director George Smith, stressed safety above all else. Two events were flown that day, and only the top 15 fliers in each event moved on to Sunday's running.

• **10 Touch-and-Go's.** Contestants' planes had to take off and perform at least a 180-degree turn before each touch-and-go. The clock didn't stop until you landed after your 10th touch. Simple, right? Twenty-two of the entries were disqualified! Most pilots decided that looping (touching at the bottom) was the quickest way through the event. Harold Parker's practicing definitely paid off, as he set a scorching 24.14-second time with his "Coal Hauler." (A kit version will be available from the Florio Flyer Corp.*)

The next fastest was two-year reigning champion Jerry Smith with his "Smith Special" at 31.86 seconds. Hot on Jerry's heels was 13-year-old David Schlabach with 33.47 seconds. The 15th qualifying

FUN-FLY NATS TOP 10

	MODIFIED TRIPLE		TOUCH-&-GO'S		INVERTED LIMBO		FINAL SCORE
Pilot's Name	Score	Time	Score	Time	Score	Time	
1. David Grantham	100.00	28.63	88.49	28.50	86.59	42.94	275.08
2. David Schlabach	83.15	34.43	95.28	26.47	67.83	54.81	246.27
3. Jeffery Gilbert Jr.	80.17	35.71	80.29	31.41	69.28	53.67	229.74
4. James Barr	85.23	33.59	77.08	32.72	55.94	66.47	218.25
5. David Baron	66.20	43.25	69.51	36.28	59.07	62.94	194.78
6. David Von Linsowe	82.03	34.90	98.29	25.66	0.00	DNF	180.32
7. William Wachtler	78.03	36.69	100.00	25.22	0.00	DNF	178.03
8. Ken Jackson	83.37	34.34	83.62	30.16	0.00	DNF	166.99
9. Chris Plumley	88.53	32.34	75.85	33.25	0.00	DNF	164.38
10. Herman Cholewinski	64.34	44.50	64.82	38.91	32.53	114.28	161.69

spot was only 47.63 seconds.

To entertain the spectators, the Schluter helicopter team put on a demonstration of their machines, which included the Whopper autogyro.

• **"Roops".** Planes had to take off, roll, then loop five times and land on the mowed runway. (Those who qualified in the touch-and-go event didn't have to enter this event.) David Nixon made up for his "did not finish" (DNF) in the first event by rocketing to a 15.29-second time. Next was Tom Dobbs, who placed with a 15.85-second time (he missed the cut-off in the first event by a scant 2.05 seconds). Robin Drake rounded out 3rd with 16.95 seconds. Less than 6 seconds separated the top 15, and those with times over 21 seconds in the Roops were now spectators.

Third place went to Jeffery Gilbert, Jr.—not bad for a 15-year-old who said that he's been flying these competition planes for only 3 months!

On Saturday evening, contestants were invited to the annual banquet at the Space Center Holiday Inn, which was also the contest headquarters.

THE FINALISTS COMPETE

Sunday morning, rain threatened, but the skies cleared prior to the pilots' meeting. Three events were scheduled:

• **Modified Triple-Dixie Death.** The objective was to take off, perform three loops, three rolls, a touch-and-go; three loops, three rolls, a touch-and-go; three loops, three rolls and then land on the mowed runway. Planning and execution were key.

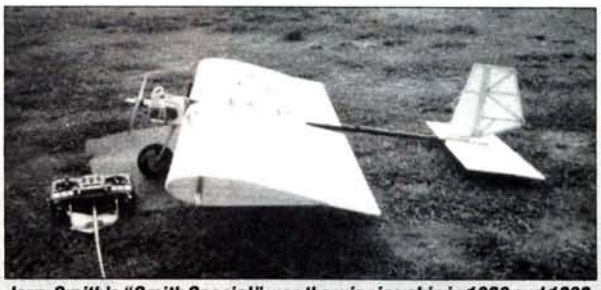
David Grantham, (the champ in '88 and 2nd-place winner in '90) didn't forget anything; he posted 28.63 seconds. Tom Dobbs was right on David's stabilizer at 31.59 seconds. Holding on to 3rd was Jerry Smith's white "Special."

EVOLUTION OF THE COMPETITION FUN-FLY AIRCRAFT

"Astounding" doesn't begin to describe the flight of a pod-and-boom aircraft. Although they're often powered by .32-size engines, the trend at this year's Nats was toward light .40s (e.g., the HP Gold Cup). Props are usually 10 to 11 inches in diameter with a pitch of around 4 inches. This size of prop keeps the airplane from moving too fast, and it even brakes the plane to reduce its speed between maneuvers. A carbon-fiber tube or a glass arrowshaft is used as a fuselage. Computer mixing—a practical necessity for competition—usually includes elevator/flaperon, spoiler/throttle coupling and exponential throws.

Florio Flyer Corp.'s Jim Florio with the V-Tail prototype of the "Yankee Twister."

Two-ounce fuel tanks, a single wheel plus wing skids, 1/8- or 3/32-inch balsa ribs and light plastic film covering were typical. These planes took off in 3 feet and rarely flew above 50 feet. Some contestants, looking down on the plane, walked beside it as it completed its maneuvers!



Jerry Smith's "Smith Special" was the winning ship in 1989 and 1990.

I set out to trace the roots of these outlaw airplanes at this year's fun-fly Nats. Dan Stevens, inventor of the Stick-It IV* and often regarded as the father of the pod-and-boom aircraft (he was the first to publish plans), was quick to point out that the idea was developed through the efforts of many people throughout the country.

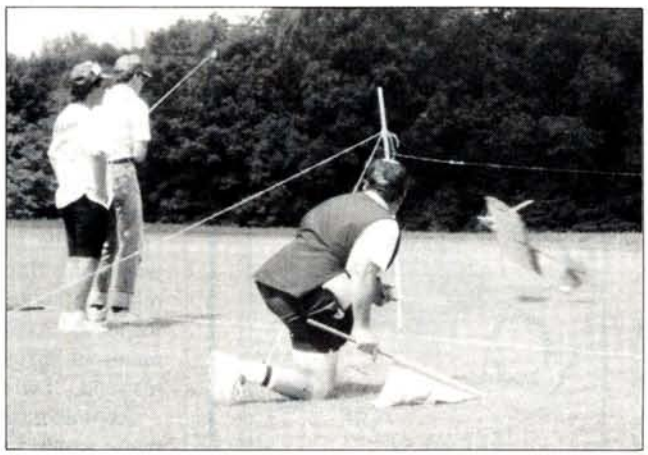
Dan talked about Al Algood of Georgia. Al had a .25-powered ship that had an aluminum tail boom and a tremendous roll rate. Dan and his friend Mac Hodges had been flying profile-type fuselages with enormous control surfaces (4-inch-chord ailerons). Mac adapted a spare helicopter boom to the design. The single-wheel idea was discussed one evening during a telephone conversation.

Dan Stevens, inventor of the "Stick-It" series.

The availability of inexpensive (considering the mixing functions) computer radios further boosted aerobatic performance. As information was shared, performance increased. Prominent names in this evolution include Kentuckians Jerry Smith (Smith Special*), Harold Parker (Coal Hauler) and Tommy Georges (Yard-Dart*). South Carolina's Ken Jackson, Chris Plumley and 1991 champ David Grantham of Georgia are three more of the many who have contributed.

PHOTOS BY BOB HASTINGS

• **10 Touch-and-Go's.** Using the same rules that were used on Saturday, most pilots either chose loops or figure-8s. William Wachtler, who qualified 8th in Saturday's T-and-G's, shaved nearly 15 seconds off his previous score, for a record 25.22-second time. David Von Linsowe showed that he was more than just an accomplished pattern flier with a 25.66-second time. Once again in the top running was the amazing David Schlabach with 26.47 seconds.



Dave Baron (5th place overall) completes the "Inverted Limbo," which was the last event. Only seven out of 30 fliers finished this event. (Photo by Daryl Luchaco.)

• **Inverted Limbo.** Picture this: two poles, 25 feet apart, hold a ribbon suspended 4 feet in the air. The task: make three passes underneath the ribbon as fast as you dare, roll upright and land on the runway. Mac Hodges needed to make up for lost points after a DNF in the first round (his plane came to rest off the mowed runway). He took off, did a half outside loop, hit the afterburners and stunned the competition with a 37.18-second time!

All the planes were given a thorough safety inspection. The author's "Smith Special" gets the seal of approval.

David Grantham had some tense moments. On his third pass, his wheel actually struck the limbo ribbon! Fifteen-year-old Jeffery Gilbert Jr. flew as brightly as his neon shorts with a 53.67-second time. Although "thumb-glitches" got in the way of most, successful completions were earned by David Schlabach, Dave Baron, James Barr and Herman Cholewinski.

NARCA officials went to work tallying the scores, and David Grantham led the field with 275.08 of a possible 300 points. Second belonged to David Schlabach, and 3rd-place honors went to the other "mean flying teen," Jeffery Gilbert Jr.

How did the winners do it? David Grantham said, "All the planes are equally capable; the only advantage is in the thumbs." David Schlabach credits his achievement to "Nintendo and great thumbs." Jeffery Gilbert Jr., who has been flying for six of his 15 years (only 3 months with the pod-and-boom aircraft), said that he "burned lots of fuel!"

Spectators and competitors were also treated to the Bama Fliers, an AMA show team. Their exhibition included a mock dogfight, a flying witch, a Porsche and a lawn mower.

The members of NARCA, Dave Montgomery, Gordon Banks, the organizers, the contributors and the sponsors are to be applauded for their dedication and hard work. This was one of the finest contests that I've attended. Now it's time to start building and practicing for 1992!

**Here are the addresses that are pertinent to this article:*

Florio Flyer Corp., *P.O. Box 88, 149 Scotland St., Dagus Mines, PA 15831.*

Stick-It IV, *Air Flair, P.O. Box 2075, Fairborn, OH 45324.*

Smith Special Plans, *Jerry L. Smith, 3970 Contest Rd., Paducah, KY 42001; (502) 554-7413.*

Yard-Dart, *Capstone R/C Suppliers, 562 W. Schrock Rd., Westerville, OH 43081; (614) 899-6313.* ■

MANHATTAN FLIGHT

(Continued from page 25)

The plane would have to fly over or under no less than 19 bridges in its history-making odyssey. The lead boat would serve as a scout, its crew radioing instructions on conditions ahead. At each hand-off point (typically a bridge), the crew of the boat from which the plane was being flown would radio, "Are you ready to switch?" The lead boat would respond, "Affirmative," and the communications officer in the rear boat would respond, "Switch."

At that moment, the pilot flying the plane would turn off his transmitter, and the pilot in the lead boat would flip his on. There was no apparent change in the aircraft's bearing. The rear boat would then position itself for the next hand-off, being careful not to rock the other "flying" boat in its wake as it passed by.

PLANNING THE COURSE

Before the attempt, I asked Angelo about the preparations: "We contacted the FAA, the harbor police and each of the four heliports around the city." All agencies consented. None of the heliports would be active during the flight. "We chose 6 a.m. as the best time, because there's little, if any, boat traffic." Angelo also noted that the AMA sanctioned the attempt as an official event.

They made five practice runs around Manhattan to chart hand-off points and river conditions. The great variety of buildings and bridges that had to be negotiated would require careful piloting of the plane. Likewise, the sometimes tricky currents of the Harlem and East Rivers would put demands on the boat captains. A detailed, written flight plan was created.

(Continued on page 80)

MANHATTAN FLIGHT

(Continued from page 78)

All equipment was also thoroughly tested. Endurance flights verified projected flight time and fuel and battery reserve, and water trials in Jamaica Bay compared the boats' speed ranges with that of the model. Frequency scanners were used in the practice runs to verify the "cleanest" R/C channels. As the final countdown approached, the weather and tide were monitored.

VICTORY IS REALIZED

The 6:12 a.m. takeoff was flawless. When the plane was out a few 100 yards over the water, the lead boat took it and headed toward the tip of Manhattan. Dawn had just broken, and the giant skyscrapers gleamed in green, bronze, metallic blue and silver hues.

The team proceeded up the Hudson at

(Continued on page 99)

ABOUT THOSE ENGINES

by JOE WAGNER

Some 1/2A history

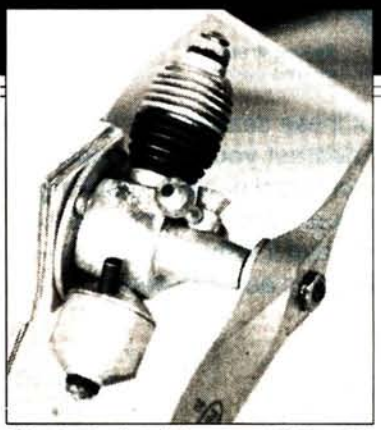
DURING THE 1948 Christmas season, the very first 1/2A engine came on the market: K&B's .020 Infant. No taller than a matchstick, and with little more power than four strands of 1/4-inch rubber, the Infant caught the attention of model fliers everywhere by showing them what was possible in the way of model engine miniaturization.

Since then, there have been literally hundreds of different makes and models of 1/2A engines. Cox alone has produced more than 80 separate versions of .010- through .051-size engines. Through the years, each new 1/2A represented a fresh attempt to "improve the breed," and milestone designs such as the OK Cub, the Anderson Baby Spitfire, the Holland Wasp and the Cox Thermal Hopper provided ever-increasing performance levels.

The fantastic Shuriken .050 looks even more impressive in color, with its red and black anodized finish. (This one sports an optional radial mount adapter.)

Now comes the latest achievement in high-power 1/2As: the Shuriken. Despite its oriental-sounding name, this motor is manufactured in Indianapolis by a firm with years of experience in full-size race-car engines. Though I've had little chance to do much with it, there's no doubt in my mind that the Shuriken stands in a class of its own.

The Shuriken contains no castings, extrusions, or plastic parts. Everything is machined from solid bar stock. That's why this engine is the heaviest (1/2 ounce more than a Tee Dee .049) and the most expensive ($200) of the 1/2A engines. Although the engine's research and development was done on 40 to 50 percent nitro, and it "needles" best at this level, the engine is designed to run on as high as 80-percent-nitro fuel, whirling a 5 1/2x5-inch speed prop at over 33,000rpm in flight—40,000rpm with a tuned pipe!



This is the first 1/2A motor: K&B's .020 "Infant," made in late '48. This well-used specimen is still being flown today by Steve Staples in Little Rock, AR.

Surprisingly, visual scrutiny of the Shuriken reveals nothing unusual. Its porting is less radical than that on some of today's larger racing engines, and its intake and exhaust-port areas seem amazingly small for such a high-performance powerhouse.

Small ports, however, generally make it easier to hand-start a model engine. The Shuriken does require a rather snappy flip to hand-start, but no more so than a modern model diesel.

The factory's instruction sheet describes the Shuriken's starting procedure in complete detail, but it doesn't mention electric starters. There may be a good reason for this! My specimen is used, and its

(Continued on page 111)

REBUTTING A RUMOR

Disturbing rumors about various facets of the model airplane game often sprout up and spread like crabgrass. Two that I've recently heard (from several sources) claim that K&B and Fox engines aren't being made any more.

Betty Fox, now in command at Fox Manufacturing, is no novice at model engine making. She has been active in the company since 1954.

There's no truth to these rumors. K&B did move recently from its long-time home in Los Angeles to the Arizona border town of Lake Havasu City, and this disrupted its shipments briefly, but all of K&B's operations are in full swing again, including their spare parts department and their engine repair service. I've talked with John Brodbeck Jr. twice in the last few weeks, and he assures me that all is well at the K&B factory.

Duke Fox's recent death may be the reason for false rumors about Fox Manufacturing closing up shop. What most people don't realize is that Duke's widow, Betty, has been Duke's partner in the engine company since 1954, and she managed it competently during Duke's illness.

Betty Fox isn't a modeler herself, and she leaves motor design and development to her engineering staff, but she's doing a great job of running the company, and she has no plans to shut it down.

Q & A SECTION

I always appreciate readers' input, and I respond to every letter I receive (please include an SASE, though). I do my very best to answer all the questions thoroughly and accurately—even if it takes several pages. Sometimes, the questions are of general interest and can be answered briefly; I'll respond to such queries in "Questions and Answers" (Q&A). Please send your model engine queries to me at 251 Danbury Rd., Wilton, CT 06897, not to the Mount Morris, IL, subscriber office!

Max Hayes of Australia wants to know where he can find replacement ball bearings for an out-of-production engine he owns.

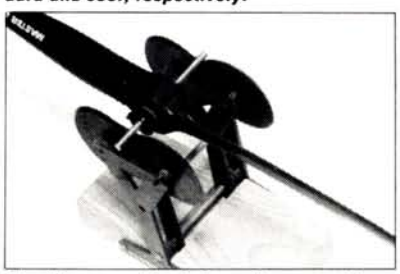
There are many ball-bearing suppliers in the USA, and probably in Australia, too. Bearing sizes, materials and tolerances have long been standardized worldwide. For model engine use, the most important variable after the bearing's size is its quality class, which is specified by the letters ABEC followed by an odd number from 1 to 9.

ABEC 1 ball bearings are the cheapest and lowest grade; they're used in furniture casters, rollerskates, etc., and they're only good at low rpm. ABEC 3 is the most common type, and it's suitable for most grease-lubricated ball-bearing applications. Many model engine makers use ABEC 5-quality bearings, but ABEC 7 are better for high-speed engines. ABEC 9 is "instrument grade," used in high-precision applications such as gyroscopes. If you expect rust to be a problem, 440-C stainless-steel ball bearings are available. These aren't immmune to all corrosion, but, in general, they're quite resistant to rust.

Evan Erickson of Champlin, MN, inquired about smoke-generating systems. Three types have been used in R/C models: chemical, pyrotechnic and vaporized hydrocarbon. Only vaporized hydrocarbon is safe and legal!

In this arrangement, the engine crankcase is "tapped" with a special fitting to provide pressure for pumping the kerosene. (Muffler pressure may not be high enough for this job, especially at part-throttle.) The kerosene is fed from the tank to the valve inlet, then from the valve outlet to another fitting installed in the muffler close to the engine exhaust port.

Red, yellow and blue packaging identify Fireball's glow plug heat ratings: hot, standard and cool, respectively.



Checking propeller balance is easy with an inexpensive stand of this sort. Several good types are on the market.

When the shut-off valve is opened, kerosene is sprayed into the hot exhaust stream and is vaporized; dense white smoke then pours from the muffler outlet.

A typical "smoke" system includes a gasoline-compatible fuel tank, a means of pressurizing this tank, a radio-controlled valve to turn the kerosene flow on and off, and fittings and Tygon-type fuel tubing to connect everything. For about $33, you can buy a smoke-system installation kit from Harry Higley.

Jack Watkins writes from New York, NY, to ask several questions: "What exactly is the difference between a 'hot' and a 'cold' glow plug, and how can I tell which to use? Also, how important is propeller balancing? Couldn't an out-of-balance prop be installed in such a position that its vibration would cancel out some or all of the engine's vibration?"

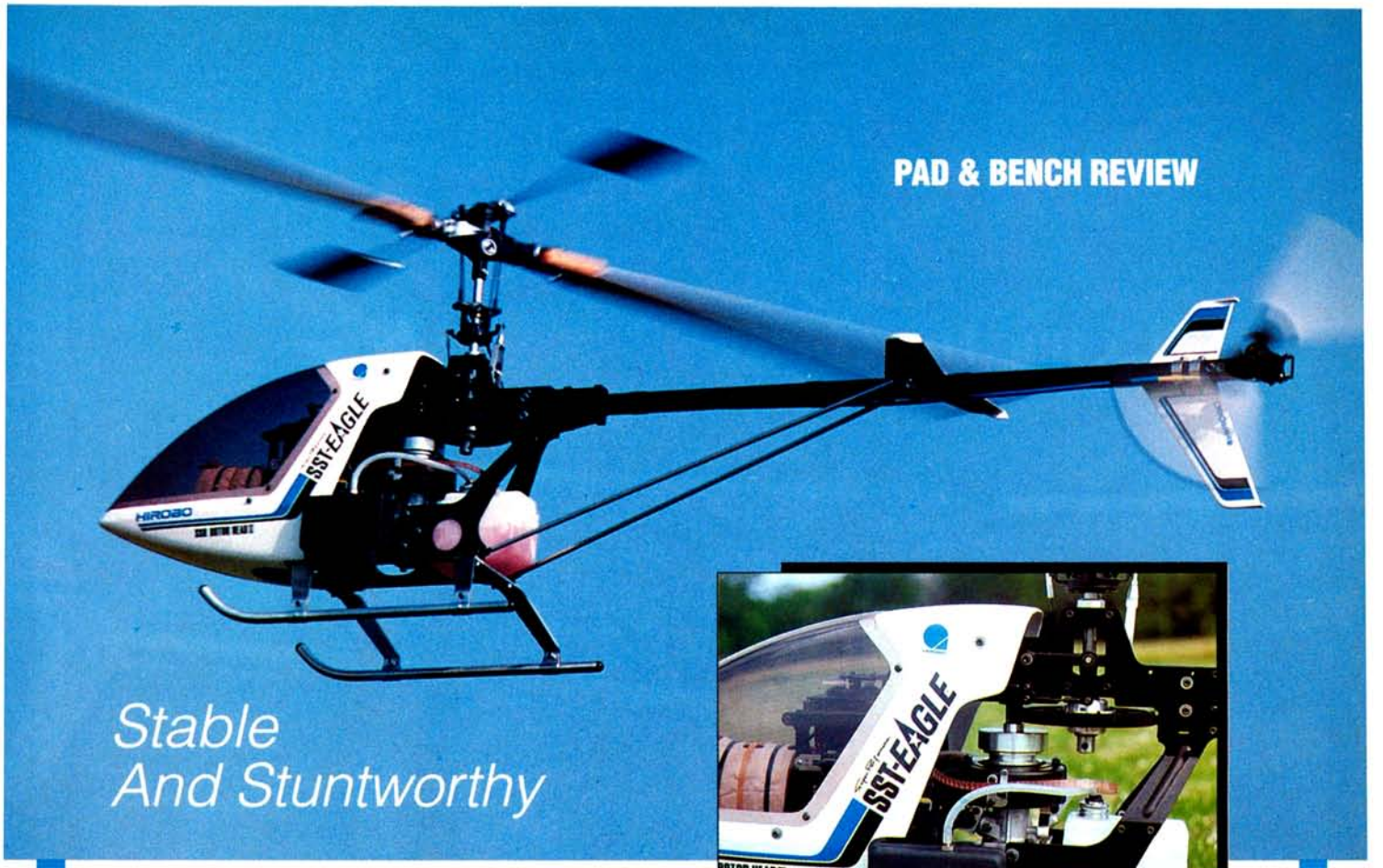
When you think of which glow plug to use in your engine, think of producing a happy medium. An engine that runs cool, such as an HB or a 4-stroke, needs a hot plug, i.e., one with a relatively thick element that retains heat and reliably ignites a cooler-than-usual incoming fuel-air charge.

An engine that runs hot needs a cool plug, i.e., one with thin wire in its glow filament. This thinner element helps reduce "pre-ignition" (firing of the incoming mixture before the piston reaches the top of its stroke). Four-stroke glow plugs are usually "hot." As for the others, only Fireball-brand plugs are available in hot, normal (standard) and cool.

Here's a good way to determine that you're using the right plug: if your engine runs OK with the plug battery connected, but sags when you disconnect it, your plug is too cool. If the motor "bites back" (if it tries to run backwards when you hand-flip the prop while the plug is lit), your glow plug is too hot. Standard plugs seem best for most R/C engines that have to operate reliably at a wide range of speeds.

As for propeller balancing, theoretically, it may appear possible to make an engine run more smoothly by installing an unbalanced prop in precisely the right position. In practice, it's highly unlikely that this would work. How much "unbalance" would you use? How would you determine the prop position?

Trial and error *might* produce less vibration if everything were exactly right, but chances are that it would be no better, and it might be even worse. That's why balancing model engine props is a good thing to do. There's no way a balanced propeller can hurt performance or increase vibration!



Stable And Stuntworthy

HIROBO

SST★EAGLE

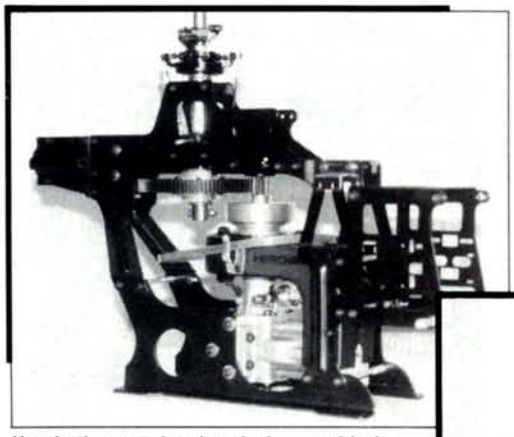
by JOHN BONA

HIROBO* has been a well-known, respected name in the world of R/C helicopters for many years. One of their ultimate pod-and-boom machines—the SST Eagle—features much of the engineering know-how that has been developed during the last 10 years, and its workmanship seems to have been well thought out and appears to be of a high quality.

Here I am with the Hirobo SST Eagle.

PACKAGED WITH PRIDE

All the Eagle kit contents are packed neatly in boxes and containers. The large parts, i.e., the main frames and all related parts, are shipped in a formed-plastic tray with a clear adhesive-backed covering that holds the parts in place. The small parts (linkages, ball links, nuts, bolts, screws, etc.) come in bags with numbers that correspond to assembly steps. The high-quality fiberglass canopy comes with a slightly tinted windshield that you attach with five self-tapping screws. The kit also includes a



Here's the completed main frame with the engine/clutch and the main-shaft sub-assemblies in place. Notice the belt-starter system.

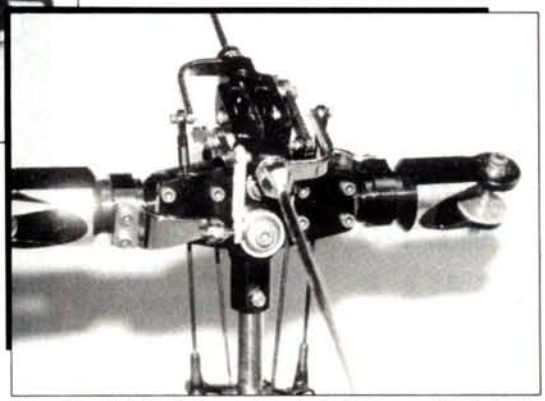
44-page instruction manual and an excellent decal sheet.

ASSEMBLY

Assembly consists of building several sub-assemblies, which you then join to complete the model. Before you start construction, *read the instruction manual thoroughly a few times*. It has all the necessary information, but you really have to look for it in some of the steps, especially if you don't have much building experience.

Here are some assembly highlights; I've also included a few helpful tips.

• **Rotor head.** The Eagle uses the SSR-II (Super-Sharp Response) rotor. Made of precision-machined metal, this DDF (dual damper flapping) rotor, has two main blade axles, and it doesn't have an underslung flybar. It was supposedly the type used on the heli that won the '89 F3C World Champs. It comes assembled, and you only have to add the flybar, the flybar control arms and the paddles. The paddles are CG corrected; the metal in-line swashplate comes assembled; just screw in the ball pivots.



The all-metal, in-line swashplate comes assembled; just screw in the ball pivots. The paddles are CG corrected.

SST EAGLE

• **Engine fan and clutch setup.** Although the belt-starting system saves you assembly time (there isn't a clutch-starting shaft to "zero in"), I have a few words of warning. After I had removed the prop-back washer from my Enya* 60XF engine, I noticed that a 1mm flange extended beyond the front bearing. You *must* remove this or the front rotor housing won't be flush with the front bearing. If it isn't flush, binding will occur between the cooling fan and the front housing. Also, to provide the proper clearance for the clutch hub, you may have to shorten the crankshaft by about 4mm.

After you've made these mods, install the tapered alignment cone, the cooling fan and the starting pulley, and secure them with one of the three supplied alignment collars. (Your choice will depend on the engine application.) Apply Loctite* to the drive nut, and tighten it securely. Install the clutch assembly securely with two M4x10 socket-head screws and Loctite.

• **Side frames.** Each side frame has three pieces. At first, just join the cross-members and attach the engine mount loosely; then, to align everything

JUST THE GYRO...

The compact, light NEJ-120BB JR* Gyro has a totally new design, and it operates off the flight pack. The dual-sensitivity amplifier is small, and you can mount it near the receiver. By plugging it into an auxiliary channel at the receiver, you can adjust the amplifier at the flip of a switch.

You can also reverse the direction of the Gyro: just unplug the power cord that runs to the sensor and reverse it. This setup also helps you to route the harness for a neat installation.

I found that the JR Gyro worked very well. It doesn't hamper quick stick input to the tail rotor, yet the tail rotor stays firmly in place. In high rate, the tail is very easy to control—even in gusts.

The NEJ-120BB only has one drawback: it doesn't have its own power switch. This results in a little extra work when you have to trim the tail rotor on a new or rebuilt machine. Trim it without the assistance of a gyro.

SPECIFICATIONS
JR NEJ-120BB Gyro

Power supply: 4.8 volts
Current drain: 100mA
Dimensions: unit—1.29x1.65x1.25 inches; amplifier—1.38x2.05x.55 inches; gain controller—.94x1.34x.63 inches.
Weight: unit—2.5 ounces; amplifier—.82 ounce; gain controller—.61 ounce.
Sug. retail price: $159.95

SST EAGLE

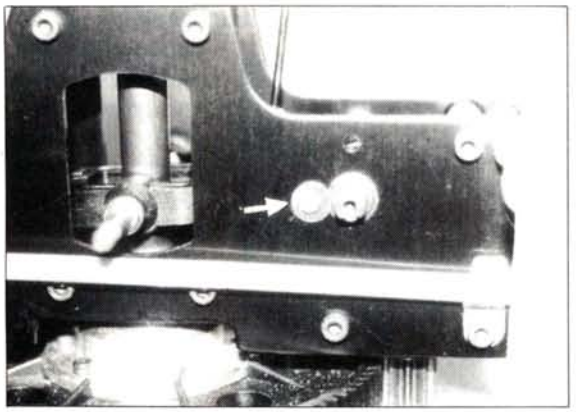
properly, set each side-frame assembly on a flat surface (don't forget to install the elevator assembly between them). When you're satisfied with the alignment, tighten all the screws securely. Temporarily mount the engine, and trial-fit the cooling fan, making the cutouts that are necessary to provide clearance for the head and the carb. When you're satisfied that everything fits properly, install the clutch drum, the starting belt and the engine.

"WITHOUT A DOUBT, THIS MACHINE WILL DO IT ALL."

• **The main-frame.** The main shaft, the autorotation gear, the swashplate and the washout assemblies come installed. In addition, the main gear is already bolted to the autorotation hub and secured to the main shaft by an M3x20 socket-head screw. Install the assembled front tail-rotor transmission between the side frames, and adjust the gear mesh by inserting a piece of tissue paper between the gears and tightening them with M3x10 screws.

Bolt the all-metal servo carrier together (all the cutouts for the servos, the receiver and the gyro switch and sensitivity controller are provided), and mount it to the main frame at four points. Bolt the collective and throttle servos to the side frames. (The supplied angled standoffs enable you to mount them properly.) Secure them with the M2x6 socket-head screws, washers and nuts.

• **The tail.** Ignore a few of the steps given in the manual for this, because the kit-supplied tail-rotor transmission comes assembled. The blade holders are dual ball bearing, and the pitch plate, the pitch lever and the blade hubs come installed. I was really impressed by the number of ball bearings; every conceivable pivot point has one, and this results in slop-free pitch-control input. Hirobo calls this unit the EX tail-rotor gearbox.

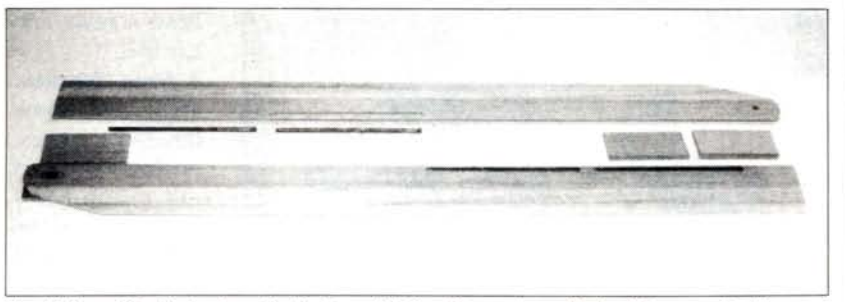


Instead of using shoulder bearings for the pitch lever, I drilled a 2mm hole near the bearing and installed a 2.6mm screw and a flat washer.

Attach the gearbox to the tail boom with the metal holder that you bolt to the front of the gearbox housing. Then secure the holder to the tail boom using the four M3x5 socket-head screws and washers. Secure the tail-rotor drive wire to the input shaft with the split collar. (The setscrew doesn't contact the wire; instead, it's used to tighten the collar around the wire.) You don't have to secure the front of the drive wire with setscrews because it has a double-flat end that slips into the output shaft of the front transmission. I had to shorten the drive wire by about 40mm.

The tail boom is quite long (31 inches with gearbox attached), and the kit only supplied two drive-wire guides. To prevent drive-wire "whip," you should install more guides (I used two) and space them equally along the tail boom. Before you add the tail-boom supports, install the fuel tank between the side frames. Remove one of the cross-members

(Continued on page 94)



The high-quality blades have flat-bottom airfoils. After you've added reinforcement plates and weights, cover the blades with the provided heat-shrink material.

SPECIFICATIONS
Hirobo SST Eagle

Type: Pod-and-boom helicopter
Main-rotor diameter: 59 1/2 inches
Tail-rotor diameter: 11 5/8 inches
Length: 52 1/2 inches
Weight: 11 pounds
Gear ratio: 9.7:1
Engine: Enya 60XF 4H
Radio: JR Galaxy Computer 8 PCM
Servos: 5-4001
Gyro: JR NEJ-120BB
Sug. retail price: $1,225
Features: assembled SSR-II, precision-machined-metal rotor head; S-type tail-shaft drive system; light weight precision tail-gear system; reinforced main-frame sides; 500cc fuel tank.

Hits:
- Excellent aerobatic capabilities, yet very stable.
- Stable flight characteristics make it comfortable to fly and instill a lot of confidence.
- Sturdy, precision-machined components.

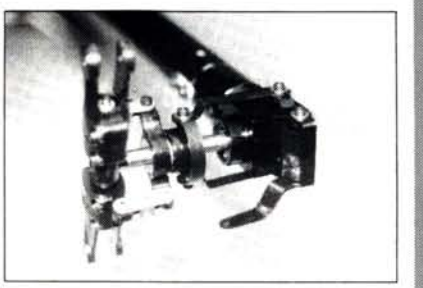
Misses:
- Instructions are sometimes confusing and ambiguous; they need improvement.
- Use of wooden tail-rotor blades with the high-speed EX gearbox.

(Continued from page 92)

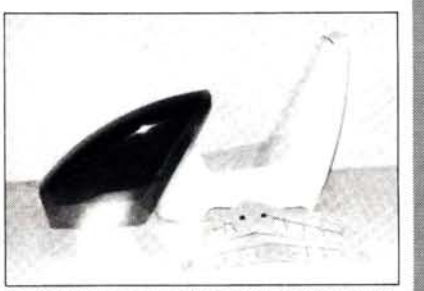
from behind the engine and re-install it on top of the tank. This will prevent the tank from moving in any direction. To complete the main assembly, install the tail-boom supports, add the horizontal and vertical stabilizers, and assemble the landing gear and bolt it to the main frame.

• **Collective-pitch linkage.** I encountered a problem here. The instructions say that you use shoulder bearings for the pitch-lever shaft. They aren't in the kit and, from what I understand, they aren't easy to come by. To solve this, just drill a 2mm hole near the bearing, and secure it with a 2.6mm screw and a flat washer.

• **Main-rotor blades.** The high-quality main-rotor blades have flat-bottom airfoils. (I used a set of Hirobo



The EX tail-rotor gearbox has ball bearings at every pivot point and is impressively slop-free and precise.



The fiberglass canopy has a tinted windshield that's secured with five self-tapping screws. A decal sheet is also provided.

weighted blades.) To prepare them, install the mounting reinforcement plates (you must do this), add the lead weights, and then sand the blades and cover them with the supplied heat-shrink covering. (I used adhesive-backed covering.) Each completed blade weighs 159 grams. Bolt them to the head, and balance the entire assembly with a High Point* Balancer. Index the blades, and set them aside.

(Continued on page 112)

Helicopter Challenge

From the beginning

by CRAIG HATH

AS I'VE mentioned many times, the purpose of this column is to spread information to the people who need it most. As far as R/C helicopters are concerned, this means beginners. During the time that I've been involved in the sport, I've seen dramatic changes in the equipment, the techniques and the levels of skill needed to enjoy this aspect of the hobby. To say that R/C helicopter technology has taken jumps forward would understate the reality.

Ten years ago, model helicopters had just begun to make appearances at flying sites around the country. For a while, I fought the urge to jump into the hobby. Then, when my brother left a Kalt Baron 20 unfinished far too long for me to stand it, I entered the new world of R/C helicopters like a "herd" of turtles! At the time, I was a fairly accomplished fixed-wing pilot, and I had even commented that people had to be nuts to get into helicopters; I must have been nuts, too!

If you heed my advice, I hope that you'll be able to avoid situations like this. Read Model Airplane News to learn about careful building and flying techniques!

While I and a few others were learning to fly these models, we encountered many problems that were different from those experienced by our fixed-wing counterparts. None of us were sure about the right rotor speeds or how to set up gyros, etc. What little information we could get was given to us mostly by other fliers who weren't much further along than we were. At one point, we received a lot of advice from a fellow who often visited our flying site, yet would never bring a model with him or take up offers to fly our models (I never did see him fly). It was a case of the blind leading the blind.

I crashed far too many times, so I spent a lot of time repairing my model. It seemed that after I solved one problem, another would pop up. I'd get myself into trouble by trying to do more than I was ready for, or something on the machine would fail. Throughout this learning process, however, the excitement of being able to control a model heli continued to grow. I don't think I ever finished a flying session without feeling that I had made progress. These little triumphs made me anxious to learn more.

GETTIN' BETTER ALL THE TIME

The operative word for today's helicopter technology is "better"—better machines, radios, building techniques, materials, engines, fuels, information—better everything. If you decide that you want to try this hobby, it's a great time to start. If you live in an area where there are active R/C helicopter fliers, talk to some of them; find out what they fly and *how* they fly it.

Seasoned pattern competitor Don Weitz also flies R/C helicopters for recreation. With some re-training, fixed-wing pilots can make the transition to flying helicopters.

I've seen people start from scratch and become really good pilots in a year or less. Its advantageous to find someone who can help you set up and adjust the helicopter and then actually fly it so that it's in ideal condition before you ever have a turn at the controls. Many areas have R/C helicopter clubs that are excellent sources of help.

If you have to go it alone, hobby shops can also be helpful. If the stores in your area don't offer helicopters and the associated parts/accessories, the people there can probably order anything you need. Try to work with them, and if that

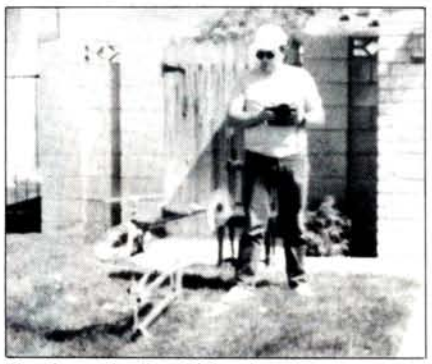
Lee Estabrook quickly became an accomplished pilot. Today, helicopters are much easier to learn to fly than they were 10 years ago.

HELICOPTER CHALLENGE

fails, many of the shops throughout the country that specialize in R/C helicopters will deal with you through the mail. Getting information this way is more difficult, so you'll have to do your homework.

MORE ADVICE ON ADVICE

Read publications such as *Model Airplane News* that have sections or



Here's my brother Blaine learning to use the Whiteman flight simulator. More on this in the next issue.

columns on helicopters. Be sure to buy a copy of *Basics of Radio-Control Helicopters* and other good books on this subject. They can guide you through every step and even help you learn how to perform advanced aerobatic maneuvers.

You can also get help by phone. Call kit manufacturers or distributors, local hobby dealers, mail-order houses, or knowledgeable individuals. The key to getting good advice over the phone is to prepare your questions in advance. Be sure to keep your conversations short. Remember that you're using other peoples' valuable time, so once you've found a helpful source, try not to abuse it.

Before you buy your first helicopter, you'll have to make some decisions. Today, one of the key issues is whether to buy a heli that you have to build, one that's partially assembled, or one that's ready to fly. Shop around, and talk to fliers in your area, if possible. Your choice of equipment is crucial to your success. You'll also need to prepare yourself for the costs. To get started, plan to spend about $1,000. You may be able to save money with used equipment, but if you go this way, be sure you know what you're buying.

The Kalt Enforcer is a great machine for beginners. Next month, I'll discuss a few others.

Next month, I'll recommend some good models for beginners and explain why they're good. I'll also cover terminology and explain how helicopters fly and how they're controlled. Until then, search around; do some digging. ■

MANHATTAN FLIGHT

(Continued from page 80)

about 30 knots and without event. As the boats neared the Harlem River, it was discovered that the Spuyten Duyvil revolving bridge was blocking the Harlem River. The plane circled for about 10 minutes as we waited for the bridge keeper to open it.

After completing the run up the Harlem River, the team continued through Hellgate—a treacherous area of swift-running, opposing currents. Thanks to the disciplined efforts of the boats' crews, the rest of the trip went like clockwork.

As we approached lower Manhattan and the end of the flight was in sight, the crew's concentration intensified. After two years of planning, nothing was going to stop them from achieving their goal. The landing was picture perfect. The mission had included flying over or under 19 bridges (the first was the George Washington Bridge; the last, the Brooklyn Bridge), and there were 17 plane hand-offs. The total flight time was 1 hour, 43 minutes, and the distance flown was 33 miles. The families of the crew gathered on the pier to share a bottle

(Continued on page 104)

GIANT STEPS

TO SCALE OR NOT TO SCALE?

by DICK PHILLIPS

Full-scale covering for models

LAST MONTH, I discussed some of the construction techniques that I've developed over the years. This month, I'll tell you about a convenient, inexpensive covering method that I've used for some time. It will enable you to produce some of the best covering jobs you've ever done.

COVERING

To cover many full-scale, fabric-covered airplanes, sleeves or stockings are made to fit the fuselage or wing assembly. They're pulled on over the assembly, sealed to the structure and then heat-shrunk to fit tightly. I've used this method on my models, and it produces an excellent covering job with minimal effort. It's also about as fail-safe as any method I've seen.

I use glider-grade Dacron, which is available at most home-building supply houses. It's quite light (.6 ounce per square foot) and, to save money, I buy mine in relatively large quantities, i.e., 50 yards at a time.

PREPARING THE SLEEVE

To prepare the fuselage for covering, measure the model, and mark the measurements on a piece of Dacron that's slightly larger than the fuselage. It isn't necessary to measure precisely; the sleeve will be fine even if the measurements are a little off.

Draw a reference line on the fabric with a fine-point pen. Measure from the firewall to each fuselage former, and make a mark for each measurement on the reference line. Draw "station" lines through the marks, making them perpendicular to the reference line. Measure the circumference of the fuselage at each former. On both ends of each station line, measure out from the reference line a distance that's half the fuselage circumference plus 1/4 inch, and make a mark. When you've laid all the points out on the fabric, draw lines between them. (The finished "drawing" should have a triangular shape.)

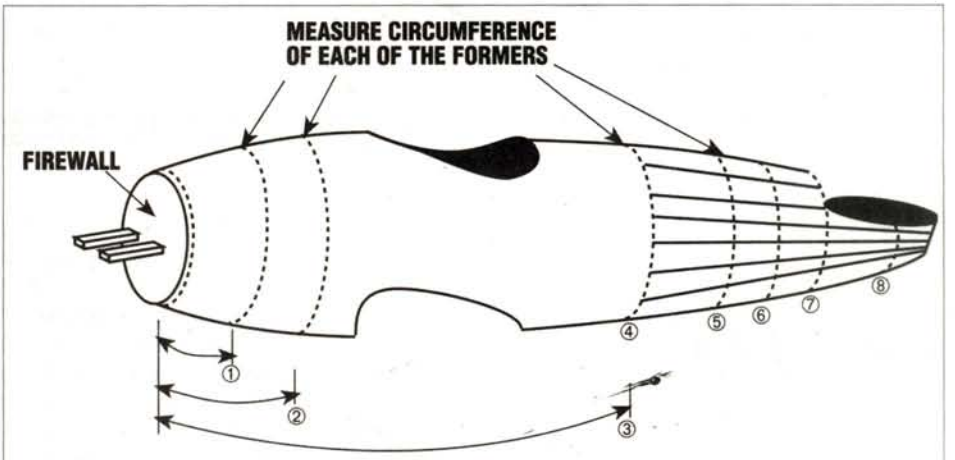


FIGURE 1


Here's the Der Jaeger in flight. Its covering is the best that I've ever done. It looks great, and it was easy and inexpensive.

Join the edges of the fabric by folding one edge down to meet the other. Sew the seam along this line using the fine-stitch setting on a sewing machine. (My wife generally does this; she's better at it than I am, and she isn't too keen on letting me use her machine!) Trim off the

(Continued on page 102)

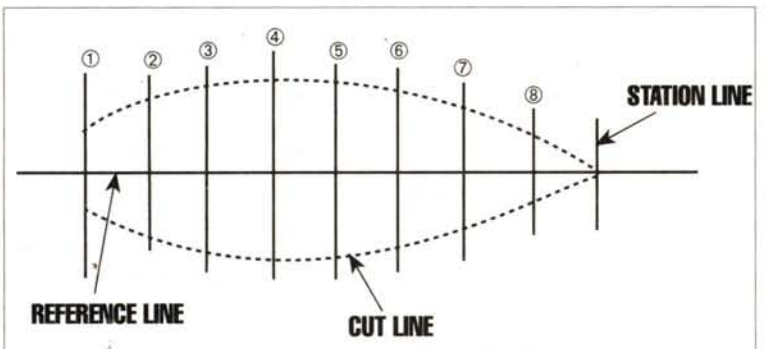
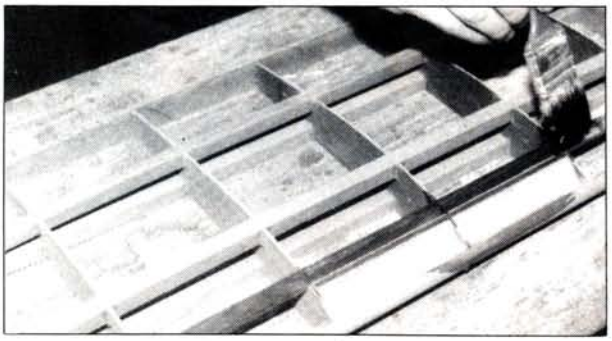
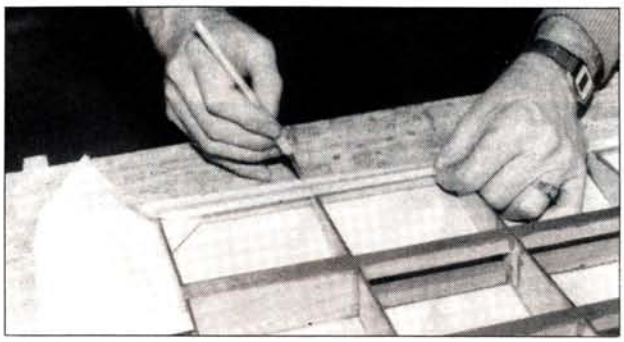


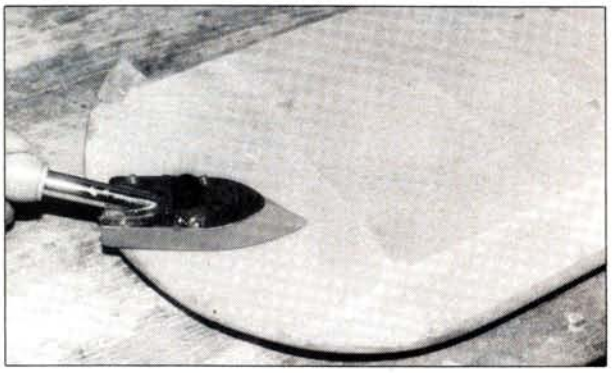
FIGURE 2 (FABRIC SHEET)



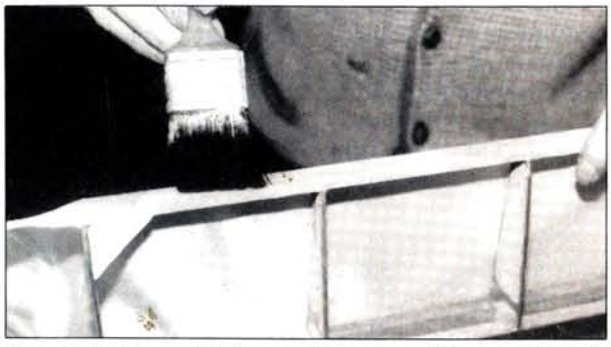
Coat the wing twice with heat-sensitive adhesive.



Start the wing covering under the trailing edge. Wrap the fabric up over the top of the wing, around the leading edge and back to the trailing edge.



Here, the fabric is being sealed to the aileron cut-out area.



Wrap the fabric completely around the wing, and then seal it over the previously sealed trailing edge.

excess to within about 1/8 inch of the sewn edge. You should now have a finished sleeve that looks a little like an airport windsock and seems much too large for the fuselage. Turn it inside-out so that the seam won't be conspicuous when you've finished the covering.

THE FUSELAGE

Although you can use most types of heat-sensitive adhesive, I buy mine at home-building supply houses. It's the material that's used on full-scale airplanes and, to use it on models, I have to thin it with acetone (about two parts adhesive to one part acetone; stir it thoroughly to mix.)

Covering jobs are only as good as the preparation work you put into it. There's no substitute for sanding and filling the structure properly before you cover it. I try to raise any depressions by wetting them with a damp sponge or a cloth and then applying a heat iron to them. If you plan to use a filler, make sure that it's compatible with the adhesive and any finishing materials you plan to apply later. Few things are worse than discovering such incompatibilities when it's too late!

When you've properly sanded and prepared the fuselage, apply two coats of adhesive for complete coverage. (With the adhesive I use, this also creates a shiny surface.) Just coat the areas that will come in contact with the covering material and the areas around any openings that you'll have to cut out later. You should also apply a 1-inch-wide coat around the edge of the firewall. The adhesive dries quite quickly, so you'll be able to apply the second coat almost immediately after the first.

APPLYING THE SLEEVE

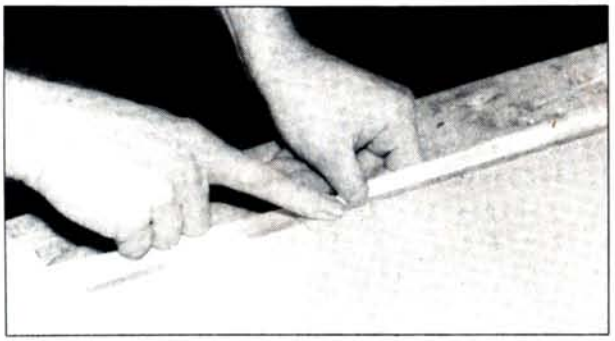
When you pull the sleeve on, keep its seam along the bottom of the fuselage where it will be less obvious. Pull it as far forward as you can, and don't force it onto the structure. Just pull it so that the fabric fits as snugly as possible.

You can use a heat-sealing iron to seal the fabric to the structure, but I find that this method shrinks the fabric unevenly. I seal it by applying acetone to it with a brush and then rubbing the acetone into the fabric. This won't cause the fabric to shrink.

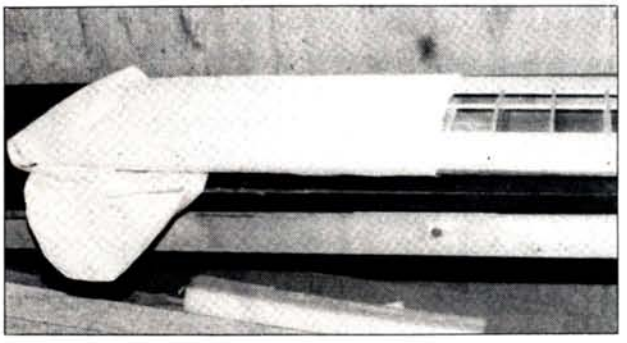
First, seal the fabric to the area around the firewall, and pull the material so that it's snug while the adhesive dries and seals. Next, make a seal at the fuselage tail post. Do one side, and then apply more adhesive and seal the other side over the top of the first seal.

When you've sealed the sleeve at the front and the rear, use a heat-sealing iron or a heat gun to shrink the fabric so that it fits the fuselage tightly. The fabric can shrink about 25 percent, so take care in lightly built-up areas. (I often beef up such areas so that they won't be distorted during the shrinking process.)

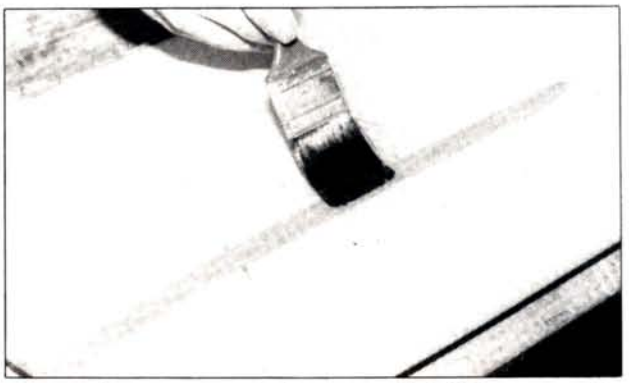
When you've finished shrinking the fabric to fit (you'll be surprised by how great it looks), seal it to the underlying structure. (Again, I prefer to brush acetone onto the surface



Seal all the edges of the fabric to the structure, and then shrink the fabric with a heat iron.



After you heat-shrink the fabric, apply acetone to it to reactivate the adhesive and seal all the areas that touch the structure.



To cover wings, you can make sleeves or socks to fit them or wrap the fabric around them. Other than having to pull sleeves/socks onto the wings (shown), the procedures for both methods are identical.

and rub it in.) Cut out the openings in the fuselage with a sharp knife, and the covering job is complete.

Whenever you use volatile liquids (e.g., the acetone and the adhesive), work carefully in a well-ventilated area. Many are toxic and harmful if you inhale them or get them in your eyes, so use safety glasses and avoid breathing the vapors. In addition, many of these liquids are flammable, so avoid working near open flames or sparks.

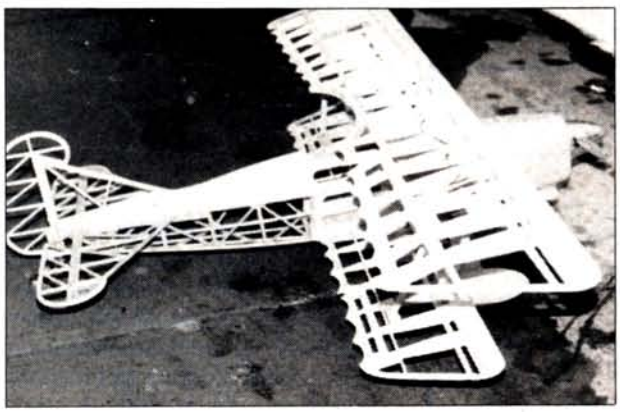
WHAT ABOUT WINGS?

Although you can cover wings and other assemblies with sleeves, I have another method that works well. As with the fuselage, I cut a piece of Dacron a little larger than necessary to cover the wing, and I apply adhesive to the areas where I will attach the covering material. I seal one edge of the fabric to the lower trailing edge so that the width of the fabric trails aft. When the glue on this seal has cured, I swing the fabric up over the top of the wing, around the leading edge and back to the trailing edge. I coat the first seal with adhesive again and seal the fabric over the trailing edge while holding it snug.

With this method, the first seal is concealed (the edge is beneath the trailing edge, facing aft), and it's fairly simple to seal the fabric to the surface of the root rib. Then I just seal the fabric at the tip to the structure. I always seal the fabric to the bottom of the tip first, and then I seal it to the top. You can use a sealing iron or a heat gun to shrink the material so that it fits snugly; the process is simple and straightforward.

Although I buy my materials at home-building supply houses, there are several hobby products that work just as well. Sig's* Koverall is a Dacron covering, and the liquid adhesives available from such companies as Coverite* are basically the same as the commercial adhesive I use.

I've successfully used both of the methods outlined for many years, and they're much easier than conventional covering methods. After you've tried them, I'm sure you'll be impressed, especially if you've had problems covering round fuselages with flat pieces of material; these methods are a great relief! In addition, they're less expensive when you consider the cost of modern covering materials.



This Balsa USA Der Jaeger was covered using the methods described in this column.

NEXT MONTH...PAINTING

Next month, I'll give you some details on the next step—painting. How do you paint over raw fabric? Well, there are a couple of ways to ensure a good finish over Dacron, and I'll discuss them.

**Here are the addresses of the companies mentioned in this article:*
Sig Mfg. Co., *401 S. Front St., Montezuma, IA 50171.*
Coverite, *420 Babylon Rd., Horsham, PA 19044.* ■

MANHATTAN FLIGHT

(Continued from page 99)

of champagne. Another victory for R/C had been achieved.

Credit must be given to Angelo Lanci, Tony Cerasani and to the rest of the team for accomplishing this milestone in R/C aviation. The obvious question: what will be next?

**Here are the addresses of the companies mentioned in this article:*
Hobby Lobby International, *5614 Franklin Pike Cir., Brentwood, TN 37027.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.* ■

TADPOLE

(Continued from page 43)

should have no trouble. Be cautious; since the structure is designed to be light and nimble, it won't stand up to prolonged full-power dives or sustained high-speed flight. Save full throttle for maneuvering and climbing, and don't exceed a propeller pitch of 4 inches. I prefer a 10x4 on a .32 and an 11x4 on a .40.

To achieve the best flight times in competition, practice flying and maneuvering as low and as close in as you can.

(Continued on page 107)

SMALL STEPS

ENYA'S 1/2A ENGINES

BY RANDY RANDOLPH

BECAUSE WE recently reviewed the .10 engines that are currently available, it seems only fair that the other engines that make up our world should get some attention.

Over the years, manufacturers have offered many kits designed especially for Cox .049 engines. Unfortunately, only a small percentage of them are still available. As radio equipment becomes smaller and more reliable, it might seem that this would increase the demand for smaller airplanes and engines; yet the converse seems to be true.

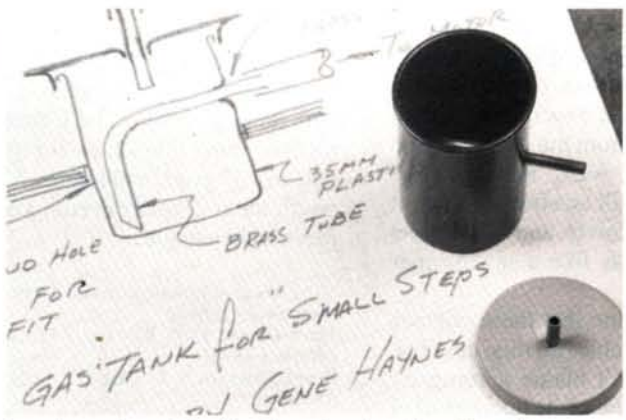
Cox has so dominated the .049 range that most of us think of Cox and the number as one word. But there *are* others! Over the years, famous names such as Atwood, Fox, K&B, Testor, and OK have produced .049 engines. The question is, what's available today?

An Enya .049 "in the flesh" (see text for a way to get one). In spite of its strange-looking carburetor, it does run. Joe Wagner will have a report in his engine column.

JAPANESE PIPELINE

The only reason most of us knew that there was such a thing as an Enya .049 was the picture in the literature packed with *other* Enya engines. Take our word for it, it *does* exist. A gentleman in Japan was kind enough to buy one for us, and it arrived just in time for us to put its picture in this issue. The price was about the same as that of the G-Mark .061 in this country.

The gentleman's name is Mark Davies, and he's stationed in Japan with the U.S. Navy. If you send Mark a $45 postal money order (U.S. funds) he'll send you a brand-new Enya .049-II TV engine from a hobby shop in Japan. That's one generous offer; treat him gently! (His address is at the end of this column.)



Gene Haynes's neat drawing shows how to make a 35mm-film-can gas tank. It works really well.

FACTS TO COME

There simply hasn't been time to do any real testing of the engine other than to mount it up on the bench and give it a little break-in time. It started with the first flip and, with the standard Cox 6x3 gray prop, it turned about 15K after 5 minutes of running on low-nitro fuel. It has been sent on to the best engine man going—our buddy Joe Wagner—for a good test. Because the instructions are all in Japanese, they'll be a little hard for him to read!

DOWN UNDER INFO

While we're waiting for Joe's report, here's some very good information about Enya engines from New Zealand. Mr. A. Mackenzie writes...

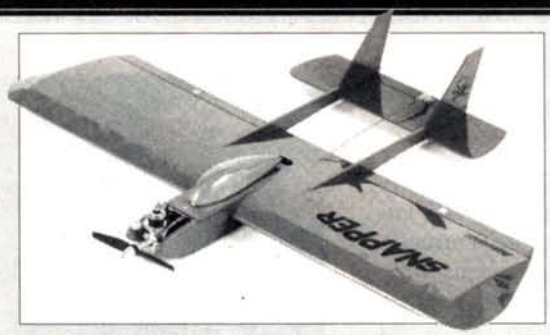
"In the January issue,

(Continued on page 106)

SMALL STEPS

(Continued from page 105)

SUPER SNAPPER



Aerocraft* is bringing out the Snapper for .049 to .10 engines. The Snapper is powered by a Cox .074, which hits the intended range right in the middle. It's also available as an .05 electric.

The complete airframe weight is given as 7 ounces, with a total 3-channel weight of 25 ounces. The fuselage structure accounts for the low airframe weight. It should be a real bombshell with one of the hot .10s.

you mentioned the little Enya .049 R/C engine, and I have a little information on another Enya engine that I think your readers will also find of interest. I'm a 'small R/C'er' as well, and also have a collection of small Enyas, but not the .049 R/C as yet.

"The company also manufactures an .06 II R/C engine in both glow and diesel. Incidentally, another diesel is an earlier .06 MK I, which dates back to 1960. Its design is rear reed valve, and it runs either direction.

"... I can report that both of the .06 models are I'm only guessing. The diesel doesn't come with a muffler; as an experiment, I tried the muffler from the glow .06, and the results were unbelievable! Starting is still an absolute snap, it idles more slowly, and it's so quiet that it sounds like a sewing machine."

It's a shame that these engines aren't available in this country. But you can't blame a company for taking care of its home market first!

WHICH SWITCH?

SMALL member Stephen Winnall of Melbourne, Australia, suggests that the printed-circuit-board "DIP" switch is just the thing for small airplanes; it's light and reliable. Since these are double switches, wire each switch in parallel.

PLANS EXCHANGE

Frank Hiles* has started something that should be of great use to a lot of us small-scale modelers—a plans-trading service! What Frank does is publish a list of all the plans he has (there are hundreds), and if you have a plan he doesn't have, he'll trade his for yours. For $2, he'll send you his 35-page catalogue. It's worth the two bucks even if you can't make a trade.

** Here are the addresses that are pertinent to this article:*
***Mark Davies,** DMS Box 303, FPO Seattle, WA 98762.*
***Frank Hiles,** HCR 63, Box 157, Ozark, AR 72949.*
***Aerocraft,** P.O. Box 553, East Northport, NY 11731.* ■

TADPOLE

(Continued from page 104)

Remember that every second you spend gaining altitude and flying away from the takeoff point will add another second to your return. Since the Tadpole gives you the ability to begin your tasks almost immediately after takeoff, learn to use this advantage well. If you get a little high (say, 50 feet or more), pop up the spoilerons and parachute down quickly. As soon as you release the spoilerons, the plane will resume normal flight. Try this out at a higher altitude until you can work the spoilerons as easily as you use the elevator. As you can tell, you won't need much space to practice, so you folks with limited flying areas will love the Tadpole. If you have a few acres out back, you won't need to drive to the flying site nearly as often.

If you can resist the temptation to build this nimble craft, and if you're looking for some good bargains on beautiful models, then find someone flying a Tadpole. Chances are good that he'll have some very pretty planes at home that never get flown anymore, and you may be able to

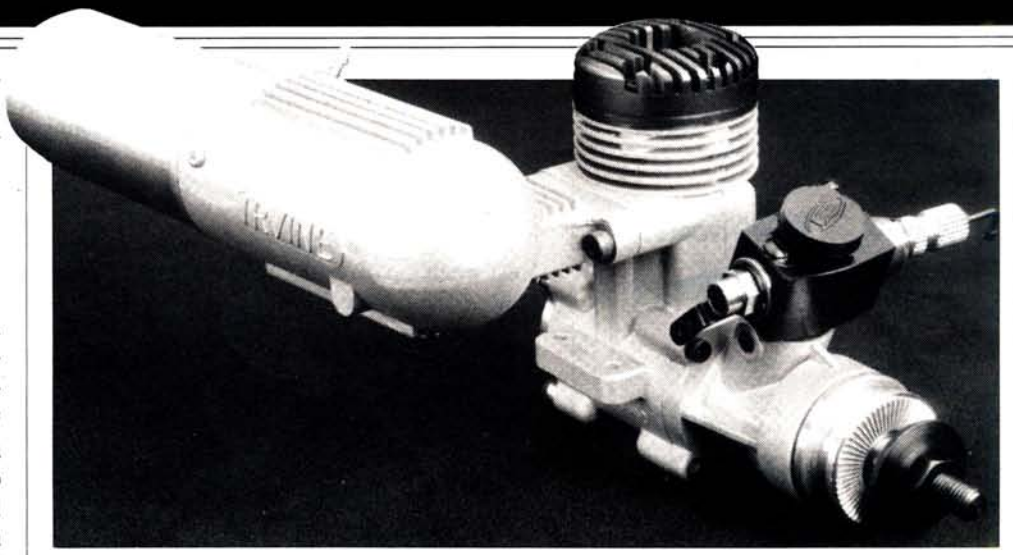
(Continued on page 111)

ENGINES ALOFT

ENGINE REVIEW

by BOB GILBERT

Irvine Q40—the silent treatment



The Q40 is an entirely new engine from Irvine, an English company. It's designed to turn larger props—like a 12x6 or an 11x7—at lower rpm levels. Like earlier Irvine engines, the Q40 runs with very little vibration.

I'VE RECEIVED an attractive silver-and-yellow box from *Model Airplane News*. It contains an Irvine* Q40 ABC engine with a muffler; they expect me to test it. It sounds great; I'll bench-run it for a bit then get it into the air for a real flight test.

Wow; what an attractive engine! Its red-anodized head, machined rear cover and black plastic-composite carb with brass fittings really look great. The carb and exhaust have rubber plugs. The engine comes with two hex wrenches—but surprise!—all the external screws are U.S. standard size. The instructions don't say so, but after seeing the large fully machined aft section of the muffler, I guess that the letter "Q" in "Q40" stands for "quiet."

I understand that this is a new "long-stroke" design, but I haven't been able to verify this from the instructions, because it doesn't give bore or stroke dimensions. I made a rough check and found the stroke to be about .768 inch. Some research by my friend Dick Purdy revealed that the Irvine 40 Sport Mark II (circa 1983) had a .720-inch stroke, so that of the Q40 is slightly longer.

Following the reasonably good instructions—but not to the letter—I ran in the engine on the bench, using an APC* 11x7 prop. Irvine's recommended props range from 10x8 to 12x6. That's very large for a .40 engine. The instructions also recommend APC props; it's unusual for an engine manufacturer to recommend a specific brand, but I think they want to make the engine/propeller combination as quiet as possible, and APC props have the reputation of running more quietly than most.

Putting the prop on the engine wasn't easy; the shaft starts out as a 1/4-28 thread, but it increases to 3/8-inch diameter. Slightly problematic! The Q40 engine hand-started on the first flip, and it started easily for all 10 of the 3-minute runs that I gave it. During the course of the break-in, it consumed two idle-bar glow plugs. It now has a Fox* Miracle plug in it. After only two runs, it idled below 3,000rpm, and the idle mixture didn't need adjusting until I changed fuel.

Is this .40 a sport engine or a speed engine? Judging by the prop sizes it takes, it will find its widest uses in sport and scale aircraft. As it weighs more than 1 pound with its muffler, it must produce lots of power to be competitive.

LET'S GO FLYING!

I installed the Q40 in a well-used, slightly modified Florio* 40 aircraft, which I hope to use as a mule for this type of engine flight test. This plane has been flown with an O.S.* .40 FP and an O.S. .46 FS; I removed an O.S. .50 FSR to install the Irvine. I had flown the O.S. .50 FSR in a competition fun fly the previous weekend, so I still had a good idea in my head as to its performance. With the Q40 installed, the plane's weight came to 5 pounds (80 ounces).

As most of my flying is oriented towards fun flys, vertical climbs are important, and they're a good indication of performance. The level of noise generated is also important to me. The temperature was about 80 degrees; it was a lovely day.

Look at the "Test Results" chart. The "dB behind" figures show the decibel (dB) readings taken 9 feet behind the engine. The "dB side" readings were taken 9 feet away from the crankshaft center line. All dB readings were taken with a Radio Shack meter (cata-

(Continued on page 110)

ENGINES ALOFT

(Continued from page 109)

logue no. 33-2050) with the weighting set at "A" and the response set at "slow." The plane was resting on grass, and I held the meter about 6 inches above the ground. I used S&W* 10-percent-nitro fuel.

Model engines often sound loudest when the dB meter is pointed at the exhaust pipe from the rear. In this airplane, however, the rear readings were significantly lower, because the exhaust exits just 1 3/4 inches in front of the thick-airfoil wing's leading edge.

In Test 1, the plane went very fast, but vertical performance was poor. In Test 2, the plane had excellent vertical performance, though not as good as with the O.S. .50 FSR engine; remember, the plane weighs 80 ounces! The plane flew vertically for a while in Test 3, but it couldn't hold it for long. In Tests 4 and 5, vertical performance was very poor, and I detected engine detonation. This engine likes coarser pitches and lower rpm. The Fox Miracle glow plug survived all this testing.

Among other things, the instructions recommend that, for sport flying, you use no-nitro fuel—80 percent methanol and 20 percent castor oil. Owing to the recent nitro shortage scares, I decided to try some. The APC 11x7 turned some 200rpm less than it had done with 10-percent nitro. Idle needed another 100rpm to be stable. The carb needed adjustment, and even after being adjusted several times, it wouldn't accelerate as cleanly as it had on 10-percent-nitro fuel. I'd say that performance was acceptable and, for some, the savings may mean something, but I'll stick to good old 10 percent.

In conclusion, this engine is attractive, performs well and is reasonably quiet. It runs acceptably well on no-nitro fuel, and in terms of vibration it's one of the smoothest running engines I've ever tested. It's refreshing to see another manufacturer attacking the problem of excessive model aircraft engine noise. This engine is a natural for beginners as well as for scale fliers. I'll be putting it in a competition fun-fly plane soon. Bravo, Irvine! This is a good one!

TEST RESULTS

Test	Prop	rpm	Idle	dB behind	dB side
1	APC 10x10	9,700	2,400	84	91
2	APC 11x7	11,000	2,500	91	90
3	APC 12x6	9,200	2,200	84	89
4	MA 11x6	11,400	2,300	89	93
5	APC 11x6	11,100	2,400	88	91.5

MA = Master Airscrew*

** Here are the addresses of the companies mentioned in this article:*
Irvine; *distributed by Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61824.*
APC Props; *distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645.*
Fox Mfg. Co., *5305 Towson Ave., Fort Smith, AR 72901.*
Florio Flyer Corp., *837 Johnsonburg Rd., St. Mary's, PA 15857.*
O.S.; *distributed by Great Planes Model Distributors.*
S&W Hobby Supply, *P.O. Box 208, Tate, PA 18085.*
Master Airscrew; *distributed by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401.* ■

TADPOLE

(Continued from page 107)

steal one. Once someone becomes accustomed to maneuvering a plane that responds to every whim without hesitation, switching back to the average sport plane is like stepping out of a Miata and onto a garden tractor.

After you've become comfortable with the Tadpole, the only element that separates you from the prizes is practice, practice and more practice. Good luck!

**Here are the addresses of the companies mentioned in this article:*
***Futaba Corp. of America,** 4 Studebaker, Irvine, CA 92718.*
***Into the Wind,** 1408 Pearl St., Boulder, CO 80302.*

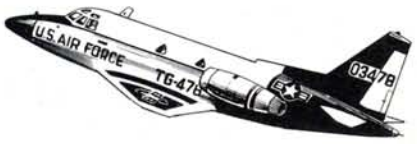
ABOUT THOSE ENGINES

(Continued from page 85)

backplate shows rub marks from the crankpin end. These parts don't touch in normal operation; the backplate wear had to have been caused by the pressure of an electric starter.

Shurikens are available in .050 and .061 displacements. Neither version comes with an R/C throttle, but it seems to me that a Cox Queen Bee throttle could be adapted to fit without too much trouble. I'll try this myself, as soon as I get the time!

[Editor's note: for more information on the Shuriken engines, please refer to "Engine Review: Shuriken .050 and .061," by Mike Billinton, Model Airplane News, May 1991.]



HIROBO SST

(Continued from page 94)

• **Tail-rotor linkage.** This instructions for this installation are easy to understand. I only made one modification. The tail-rotor control wire didn't move freely when I attached it in the proper place, so I replaced it with a Sullivan* Gold-N-Rod, which I secured to the tail boom in four places with electrical tape. Input to the tail rotor is very positive.

I encountered a problem with the control rods that run to the head and the stabilizer. The rod that runs from the washout assembly to the stabilizer arm was only 70mm long, and the rod that runs from the swashplate to the mixing arm was only 90mm long. They should have been 80mm and 110mm, respectively. I was told that some of the early kits with the new SSR-II head were shipped with the wrong control rods. If you have this problem, just contact Altech, and they'll send you the proper rods.

You should be able to install all the other linkages according to the instructions. When you've finished, check that all surfaces move in the proper directions and that the servo arms have the right amount of travel. *(Continued on page 116)*

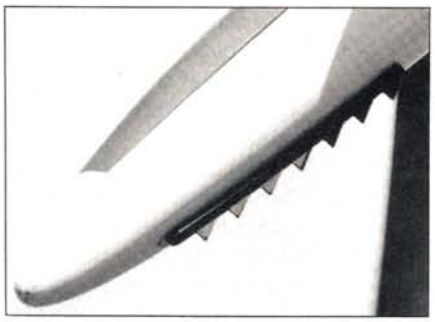
QUIET FLIGHT

DANGEROUS SKIDS AND HIGH-RATE MOTOR CONTROL

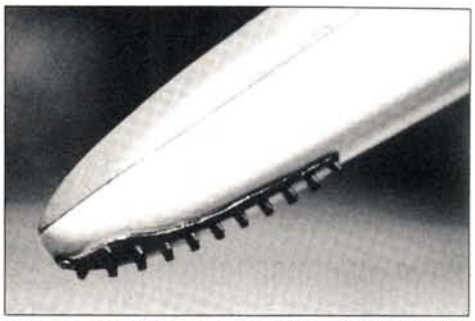
by JOHN LUPPERGER

GLIDER SKIDS—are they really necessary? At first, you might ask yourself, "What the heck is he talking about? Of course I need skids on my glider! How else can I get it to stop for that contest-winning landing score?"

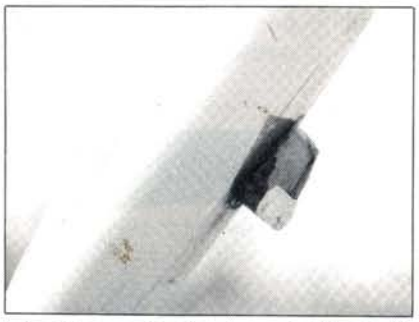
Well, for starters, you could learn to time your final approach so that you're not landing at Mach speeds. Second, you could learn to use your flaps or spoilers more effectively.



Here's the most common type of skid—sharks' teeth. They're usually made of hard rubber or plastic—sharp and dangerous.



Off-road R/C car tires make effective skids, but they've lost popularity to the even more effective sharks' teeth.



This skid may not look ominous, but it's actually a metal spike covered with several layers of tape.

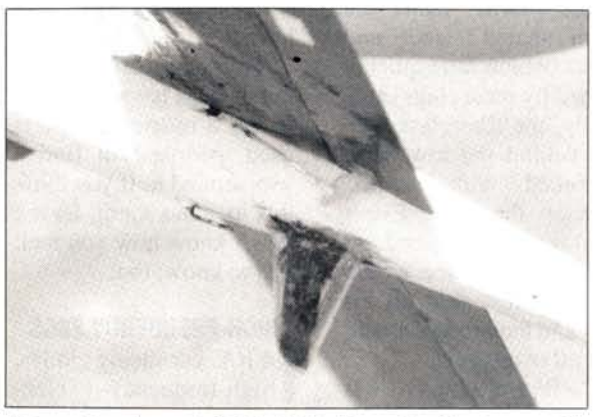
Why am I making such a big deal about landing techniques and skids? Have you looked around at a contest lately and seen the variety of sharks' teeth, saw teeth, spikes, cleats and sub-fins the models of your friends and fellow competitors? It's really getting out of hand, and it's only a matter of time until someone gets hurt! Yes, I've heard the arguments that the glider's nose is more likely to hit someone than the bottom of the fuselage, but this isn't the real issue. Even the *perception* of danger, negligence, or lack of concern for the safety of others may result in lawsuits—and possibly large court settlements.

This perception, if held by local government officials and property owners, could also prevent clubs from acquiring flying fields. Picture this: your club has arranged to hold a flight demonstration on a local land owner's property (to show him what glider flying is all about), with the hope of eventually using his land as a flying field. Naturally, your club officers will ask the best fliers to bring their models. They'll probably be competitive pilots, and they'll probably bring their contest models; these are likely to be the models with the "deadly" contest skids. To the uninitiated land owner, the skids will look ominous with their array of teeth and razor-sharp fiberglass sub-fins, and they'll probably make him feel uneasy. Is this the image you want to project?

What about the real possibility of injuries caused by these skids? I haven't seen (or heard of) anyone badly hurt by them yet, but the potential is there. (I've seen an overly exuberant pilot cut his hands on them, though, when he decided to catch his glider on final approach.) Owing to the type of teeth and the hard material that's being used to make them, skids have become more than just landing aids; they're potentially extremely dangerous.

How did this start?

(Continued on page 114)



Using a fiberglass sub-fin/sharks' teeth combination is one of the most effective ways to stop a glider; it's also the most dangerous. The front of the fin can cut like a sharp knife.

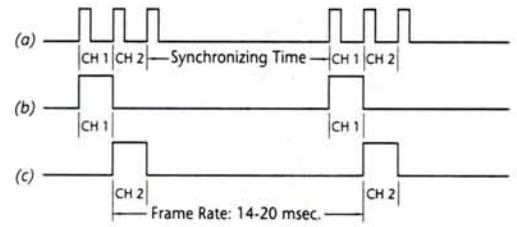


Figure 1 Receiver Signals *(a) Input from transmitter. (b) Channel 1 output (steering). (c) Channel 2 output (throttle).*

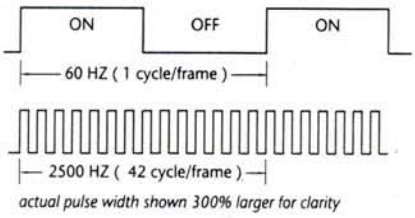


Figure 2
Current Pulses to the motor from the speed control at 50% speed. Top diagram shows the output from a low frequency ESC. Lower diagram shows the output from a high frequency ESC.

Originally, skids were just strips of smooth rubber or plastic that protected the finish on the bottom of the fuselage. Then, someone realized that "Joe Hotshot" was winning most of the contests because he could land better than everyone else. That's when the first "doormat" skid was used, and the "skid wars" escalated from there. Next came the artificial-turf skids, then the off-road car tires, the Goldberg wing-tip skids (reversed), the hard-rubber sharks' teeth, the metal sharks' teeth and spikes (which were quickly banned by most clubs) and, finally, the fiberglass sub-fins behind the tow hook combined with sharks' teeth on the nose. Every time someone gained on "Joe Hotshot," Joe would put the latest skid on his ship, and the process would start all over again.

It's time that we took a clue from the FAI/F3B fliers. The current F3B rule, which was passed for *safety* reasons, bans all skids except for those made of smooth rubber that are used only to protect the fuselage.If the F3B fliers can learn to land their clean, efficient, heavy models, then we can, too. Let's not wait for someone to get hurt. I'd like to see the AMA impose such a rule, and require that all tow hooks extend no more than 1 inch below the fuselage. They should also be required to have a curved radius to prevent them from becoming "arresting" hooks.

This may seem drastic, but the past has shown that unless a restrictive rule is used, people will find a way around it. If you think this idea has merit, let the AMA know how you feel; let me know, too.

HIGH-FREQUENCY ESCS

In R/C car racing circles, high-frequency electronic speed controllers (ESCs) are taking over. The big question is whether they offer advantages for electric fliers.

Novak is one of the companies that pioneered high-frequency ESC technology, and I thank them for the (edited) information presented here. They offer an info sheet called *Tech Talk* that puts high-frequency technology into understandable terms for average modelers.

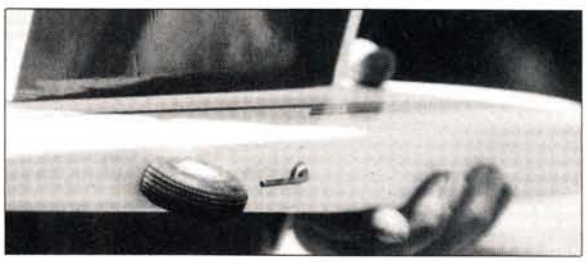
"To give you a better understanding of the principles involved, we have to review the basic theory of transmitters and pulse-width modulation (PWM), i.e., how mechanical input is transformed into electronics. PWM involves the generating and transmitting of a series of precisely timed pulses, the lengths of which are varied to convey different information. One pulse is generated and transmitted for each control channel in the transmitter. The length of each pulse varies as the transmitter control stick is moved. These control pulses are preceded by a much longer pulse called a 'synchronizing pulse.'

"Notice the pulse times involved (figure 1). One cycle of this information (before it starts to repeat itself) is called the "frame rate," and it's typically between 14 and 20 milliseconds ($^1/_{1000}$ second) long. In operation, one such control pulse is delivered to each system servo or speed controller about 60 times per second (60Hz). These pulses originate and are controlled at the transmitter only, and the receiver processes and distributes this information. The receiver does not and can not control a servo or a speed controller.

"In a speed-controlled model, the motor's speed is controlled by the PWM principle. The full battery voltage is applied to the motor in short pulses similar to those emitted by a transmitter. Effectively, the voltage is switched on and off—the rate of on-time to off-time determines and controls the motor's speed.

"Here's the important part! In older speed-controller technology, one power pulse to the motor is delivered in step with each pulse received from the transmitter, i.e., at 60Hz! This may seem fast, but electrical current flows at the speed of light, so this is actually slow. In high-frequency speed controllers (operating at 2,500Hz), the motor receives current pulses at a rate more than

(Continued on page 122)



This cut-off R/C car tire is a good alternative to a fiberglass sub-fin. The problem is, it's still used with the sharks' teeth.

HIROBO SST

(Continued from page 112)

• **Main-rotor setup.** I used a GMP* pitch gauge to set up the main rotor. Set it up at half stick first. Manually adjust the linkages for a +4-degree pitch; then set the high and low settings using the potentiometer trims on the transmitter (high pitch is +8 degrees/low pitch is -2 degrees). To maintain enough travel for a negative reading, I had to shorten the ball links that run from the mixing arm to the blade holders by 4mm each.

When you're satisfied with the setup, wrap the receiver and the battery in foam, and secure all the wiring. Even with the battery, the receiver, the gyro and the amplifier positioned as far forward as possible, the machine was noticeably tail heavy. I made a simple servo-tray extension. This moved everything forward by 3 inches, so the CG was right in spec.

FINAL ASSEMBLY

I painted the cabin and the tail feathers white and, after the paint had dried, I applied the decals and two coats of clear polyurethane, and I re-installed the tail feathers. Using the 2.6mm self-tapping screws, I secured the tinted canopy to the cabin in five places.

The Hirobo square side-exhaust muffler and extension didn't come with a pressure fitting. I like to pressurize the tank, so I installed one. I mounted the gyro to the main-frame block as close to the main shaft as possible. Although I used 1/16-inch double-sided tape to do this, Altech offers a rear mounting bracket.

FLYING

Because of the high-speed EX gearbox, I suggest that you replace the supplied wooden tail-rotor blades with plastic ones

(Continued on page 118)

HIROBO SST

(Continued from page 116)

before you fly the Eagle. The tail rotor turns in the 8,000rpm range and, even with the mounting reinforcements, the possibility of throwing a blade always exists.

After a thorough preflight check and a radio-range check, I filled the fuel tank and brought the Enya to life. (To avoid any complications, I broke-in the engine before I installed it.) With the main-rotor pitch set at +4 degrees and the engine running slightly on the rich side, the Eagle lifted off at just half stick. To perfect the blade tracking, I turned the clevis just a half turn, and the only other adjustment I had to make was to trim the tail rotor slightly.

In hover, the Eagle is rock steady, and I hovered through a few tanks to get a "feel" for it and let everything settle in. I rechecked the machine thoroughly, and the only problem I found was that the windshield had developed cracks in the areas where it's attached to the cabin. I suggest that you laminate a piece of fiberglass or another piece of the windshield material to it; it's really too thin.

For the next flight, I leaned the engine out, and this really improved the machine's responsiveness—particularly in the tail rotor. With the Eagle, hovering maneuvers are a joy; you'll be able to improve your execution of slow pirouettes, top hats, nose-in hovering, etc.

After I had accumulated some stick time, I flew a few circuits to see how the Eagle would behave in forwar flight. Again, I wasn't disappointed. The cyclic control is very smooth and precise, and in fast forward flight, the heli exhibits no tendency to pitch upward. Approaches and descents are smooth and predictable; just ease the stick back, and it settles right in—very enjoyable. *(Continued on page 122)*

HIROBO SST

(Continued from page 118)

After logging in still more stick time and gaining confidence in the machine, I checked out its aerobatic performance. I leaned the engine a little more and brought the machine into hover. To ensure that the engine was running reliably, I hovered the heli for a few minutes before I flew any maneuvers. This machine can, without a doubt, do it all: loops, rolls, Belgian stalls, split S's—even 540-degree stall turns are quick and precise. Its tail rotor is very strong, and the main-rotor head is very responsive, yet easy to control. This heli will fly through any maneuver and return to a stable hover without any problems.

The more you fly the Eagle, the more you'll like it. Whether you're a competition flier or a sport flier, it will feel comfortable. From hover to fast forward flight and aerobatics—this machine covers the entire spectrum.

**Here are the addresses of the companies mentioned in article:*

Hirobo, *distributed by Altech Marketing, P.O. Box 391, Edison, NJ 08818.*

Loctite Corp., *440 Cranwood Ct., Cleveland, OH 44128.*

Enya, *distributed by Altech Marketing.*

High Point Products, *3013 Mary Kay Ln., Glenview, IL 60025.*

Sullivan Products, *P.O. Box 5166, Baltimore, MD 21224.*

GMP/Tech Specialties, *218 Vernon Rd., Greenville, PA 16125.*

JR Remote Control, *distributed by Hobby Dynamics, 4105 Fieldstone Rd., Champaign, IL 61821.*

QUIET FLIGHT

(Continued from page 114)

40 times that fast. The basic principle is the same: power is still delivered to the motor in pulses, but more of those

(Continued on page 137)

SPORTY SCALE

TECHNIQUES

by FRANK TIANO

New releases and fast fiberglass

BY NOW, I imagine that most of you are in the first stages of the national building season. So, this month, I'm going to take it really easy and let you in on a few upcoming releases, let you "gaga" with me over some readers' projects and offer you some clever building hints.

NEWS BREAKERS

When you really think about it, the scale fraternity has been ignored for the last 15 to 20 years. Remember when scale contests were held during the lunch breaks of your favorite local contests? Remember when all the new kits unveiled at any trade show worth the value of its parking lot were of the pattern, trainer, or sport variety? Well, thank goodness, times have really changed. Modelers—even some hot-pattern fliers—are choosing designs that resemble "real" aircraft. Scale models that look like full-size airplanes and have neat finishing touches are now in vogue; those that look like converted cardboard boxes are out! During the past few months, in particular, several new scale designs have been introduced, and there are many more to come.

Franz Meier-Patton shares his beautiful "Rare Bear"—a 70-inch Bearcat—with us from his shop in Switzerland. You can duplicate the attractive purple-and-white Reno scheme on Jerry Bates' Bearcat, too.

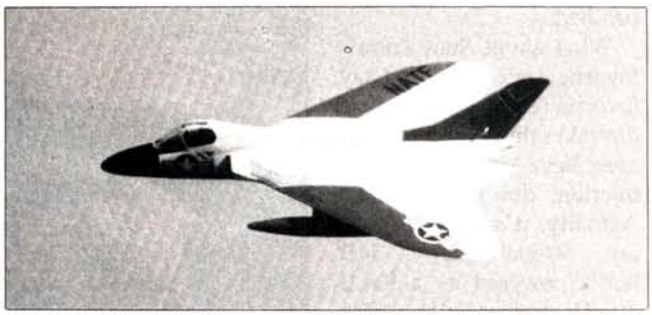
Remember Jerry Bates*? Well, his P-40 plan has sold so well that he has just released a knock-your-socks-off Bearcat of the same size. In fact, I've just contracted to offer the scale articulating landing gear and struts for this 80-inch beast. If that isn't enough, Mr. Bates has several other plans in the works. The next one will be an 80-inch French Dewoitine D.520 S. Some people call this the French Spitfire, and it should be an absolutely great model for someone entering their first scale contest. The D.520 S features simple landing gear without inner gear doors, a non-retractable tail wheel and paint schemes that are easy to document.

If the Bearcat or the D.520 S don't ring your bell, maybe the new kits just released by Skyrider Models* will. Ronnie Kemp, formally of Yellow Aircraft, has three new models about ready: a 96-inch OV-10A Bronco; an 82-inch-long T-38 Talon that's set up for a Viojett and a BVM 82 (or a shoehorn-fit Dynamax); and my personal favorite, a true 1/5-scale Bell P-39 Airacobra that spans 82 inches. All three kits are fiberglass and foam, and they should be available soon.

To keep you drooling, get a load of the B-24 I was invited to photograph on one of its demo flights! I'm not at liberty to say who's kitting this 124-inch masterpiece, but it has simple retracts, rotating turrets and operating bomb-bay doors; in other words—the works! The final molds are being finished at this time, and you can look for the kit sometime this spring. One thing I can say, its designer sure has had some great success with multi-engine designs, lately!

(Continued on page 136)

If you ever see a T-34 kit (such as those manufactured by Sig), grab it. Stan Zdon built this great-flying scale model, and it's ideal for entry-level competition. With retracts, flaps and a complete lighting system, it still weighs just 12 pounds.



Here's Mark Frankel's big, very realistic Skyray. An O.S. .90 coupled with a Dynamax 1000 fan provides ample performance and just the right amount of scale speed. The plane has a great color scheme for us old guys with failing eyesight, or for those young guys with an artistic flair! (This isn't a kit—please, no phone calls!)

SPORTY SCALE

Does this look real? All 25 pounds of this B-24 banks left—with bomb-bay doors still open—after a simulated bombing run. A new kit for four .60s may be available in time for the Toledo '92 expo.

YOUR TURN

Our good Doctor, Timothy Farrell, strikes again with a splendid rendition of away-stand-off-scale model; but it's one that flies so well—the Dynaflight Spitfire. A scale color scheme, a few panel lines and some decals can turn an average-looking model into an outstanding one. Also take a peek at Tim's new ducted-fan model. Although you can only see the fuselage plug and a few parts, I'm sure most of you will recognize the classic lines of the Northrop F-89 Scorpion. I'll have more details when it's finished.

What about Stan Zdon's favorite scale project? I say favorite 'cause any airplane that takes three years to build must have some special attraction, don't you think? Actually, it's a great-looking, 60-inch-span T-34B that's powered by a K&B .61. The trainer-yellow color scheme allows the airplane to be seen easily on dreary days that make planes with other color schemes disappear!

Another color scheme that offers great visibility can be found on Mark Frankel's new Douglas F4D Skyray, or Ford, as it was sometimes called. Actually, the aircraft isn't brand-new; it was recently rebuilt after an unfortunate crash while flying knife-edge at a mere 7 inches of altitude. Mark says it's amazing how well an airplane can fly when its center of gravity is plotted in the proper place! The model uses a Jet Model Products' Dynamax for propulsion, and it flies superbly at 14 pounds. The orange-and-white color scheme offers fabulous visibility. Mark is also building a new Skyray for the '92 Top Gun, and Tom Cook himself will handle the piloting chores!

The last colorful aircraft is also done in a yellow scheme. It's an unusual Folland Gnat built from the Carpenter (English) kit. Gerald Jones built it and, with a Webra-.80-powered Dynamax, it weighs 10 pounds. The medium yellow is rather bright, and the English roundels show up extremely well during banking.

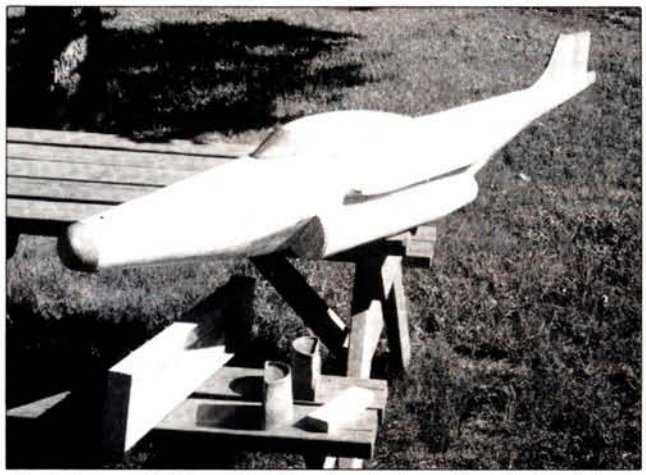
THEY'RE BAAAACK!

Actually, they never really left! Here are a couple of items that you should familiarize yourself with. The first is a product called See Temp* that's offered by Fred Splitstoser. It's a frosted, thin-plastic or Mylar material that's used to make templates of parts that you want to cut from plans. Lay See Temp over the plans, trace the part and cut out the template. Just score the material with a sharp X-Acto knife and the template will snap clear of the sheet in perfect form. The nice thing about See Temp is that the templates can be used over and over again. They're rigid enough to allow accurate tracing, and they can be stored in an envelope when you've finished with them. Frankly, I don't know how any scale modeler could be without a couple of sheets of this fabulous stuff!

My second item has all but disappeared from dealers' shelves, but it should be back in good numbers really soon. I'm talking about Dynathrust* props. That's right, those perfectly pitched, molded props that were so popular a few years ago are back, and they're better than ever.

Evidently, Ray Colelli, Dynathrust's president, had a material problem with certain sizes of his props. Under severe vibration, there was a chance that a blade could sheer—with who knew what results. Unfortunately, someone spread information that, after his tests, all Dynathrust props should be deemed unsafe! Well, I don't have to tell you what that did to Dynathrust's business! Anyway, the culprit props have been redesigned, and all sizes are back in full production. New, longer-fiber materials are being used to increase the safety of all sizes, and Dynathrust will stand behind every single

(Continued on page 141)



Here's how you start to make a fiberglass fuselage. It's called the "plug," and Tim Farrell has just about finished it. The Northrop F-89 will use two engine/fans that will be positioned side by side, to say the least. If it's successful, you can look for the plans in this column!

QUIET FLIGHT

(Continued from page 122)

pulses (of shorter duration) are received (figure 2). The advantages become obvious: more precise motor-speed control over the entire rpm range and smoother acceleration.

"High-frequency speed-controller operation doesn't result in a higher maximum motor speed, however. When the transmitter is at full throttle, the controller doesn't pulse; the motor speed is determined by the efficiency of the controller's Mosfets.

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"An obvious question comes to mind: 'Why isn't the same thing possible with older, low-frequency controllers?' The answer is: because of the time factors. There are relatively long periods of time between the 60Hz pulses; at the speed of light, 1/60 second is a long time—long enough for the voltage that's generated in the motor to fade away. This loss of energy appears as heat; it isn't available as battery-charging voltage.

"How can you tell if you have a high-frequency ESC? If you don't have electronic testing equipment, here's a simple way for you find out: a high-frequency controller causes the motor to emit a high-pitched whine as the throttle is advanced.

I hope this information gives you a better idea of what high-frequency speed controllers are all about. I've been

(Continued on page 139)

QUIET FLIGHT

told that shorter, more frequent pulses are better for ferrite motors, i.e., they'll help your motor to last longer, than those emitted by older, low-frequency controllers.

The regenerative battery-charging won't be as big an advantage to electric fliers as it is to R/C car drivers. The cars coast when they decelerate, and that's when their motors act as generators. The motors in sailplanes and old-timers (which, more often than not, have folding props), don't benefit from coasting when the planes thermal. Soon, you'll probably only be able to purchase high-frequency ESCs; they'll take over the market in much the same way that FM and FM/PCM have overshadowed AM radios. Presently, high-frequency units are available from Novak, Tekin, Hobby Lobby and Astro Flight; look for other manufacturers to follow these companies' leads. ■

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For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Laura Kidder.

SPORTY SCALE

(Continued from page 136)

prop they manufacture. The props in question were manufactured about 18 months ago, in 18x8 and 20x8 sizes. If you have a Dynathrust prop and you aren't sure of its credentials, send it back to them, and they'll either send you a new one or return yours with a safety stamp of approval. You really can't ask for much more than that!

Well, that wraps up another column. Next time, I'll explain what Frisket is—what to do with it, and how much you'll love it. Until then, your six is clear!

**Here are the addresses of the companies mentioned in this article:*
Jerry Bates' Plans, *102 Glenwood St., Mobile, AL 36606.*
Skyrider Models, *11919 Canyon Rd. E., Puyallyup, WA 98373.*
See Temp, *P.O. Box 105, Sussex, WI 53089.*
Dynathrust Props, *Box 91, Georgetown, TN 37336.*
MonoKote; *distributed by Top Flite, 2635 S. Wabash Ave., Chicago, IL 60616.*
Z-Poxy; *distributed by Pacer Technology and Research, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.*
K&B Mfg. Inc., *2100 College Dr., Lake Havasu City, AZ 86403.*

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2. Mail Subscription (Paid and/or requested)	34,710	37,225
C. Total Paid and/or Requested Circulation (Sum of 10B1 and 10B2)	66,572	71,082
D. Free Distribution by Mail, Carrier or Other Means: Samples, Complimentary, and Other Free Copies	5,974	5,810
E. Total Distribution (Sum of C and D)	72,546	77,892
F. Copies Not Distributed: 1. Office use, left over, unaccounted, spoiled after printing	3,852	4,326
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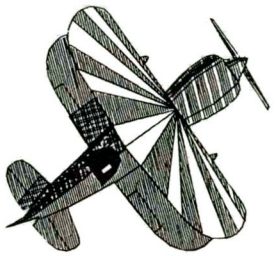
11. I certify that the statements made by me above are correct and complete. Signature and Title of Editor, Publisher, Business Manager, or Owner: Yvonne Micik

PS Form 3526, Jan. 1989

CLUB OF THE MONTH



ALABASTER R/C ASSOCIATION
c/o Joe Griffith,
312 Church St., Fairfield, AL 35064

The Alabaster Radio Control Association of Fairfield, AL, prints a newsletter that's well-written, informative and amusing. On the pages of *Crosswind*, we found the "Funny Flier of the Month" (club member Charles Roberts who, after crashing fellow member Glenn Sorrow's plane into the weeds, found the plane unscathed, then tripped, fell and severely damaged it as he carried it back to Glenn), the meeting report, a kit review of the Drifter II glider and a special "Beginning Soaring" column that gives novice gliders good advice about available models and proper building techniques.

Although there are many references to gliders, the club members are also involved with powered aircraft. ARCA held its first Combat Fun-Fly event in August '91, and *Crosswind* Editor Joe Griffith reports that the competition was keen, and as many as six aircraft often duked it out to break ties in the heats. Although there were 20-foot crepe streamers attached to the planes, there were still a few minor midairs! The contestants were good-natured about the mishaps, and everyone involved had a lot of fun. Isn't that what it's all about? The event was such a success that the club scheduled another one for September.

For their well-executed newsletter and, more important, for their all-around good attitude toward pursuing the fun of the hobby, we award two one-year subscriptions to our newest "Club of the Month." Congratulations! ■

ADVERTISER INDEX